ELECTRICAL SOUTH

AUGUST
1944

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55th SEASON

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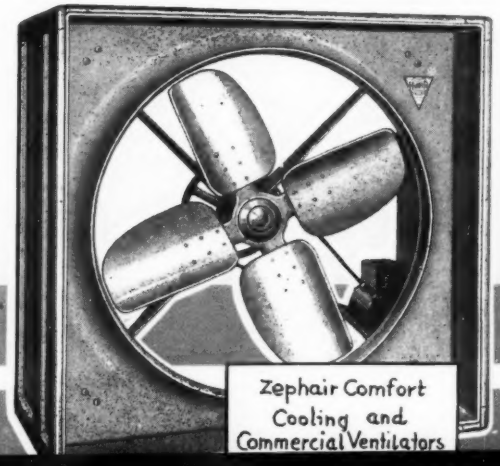

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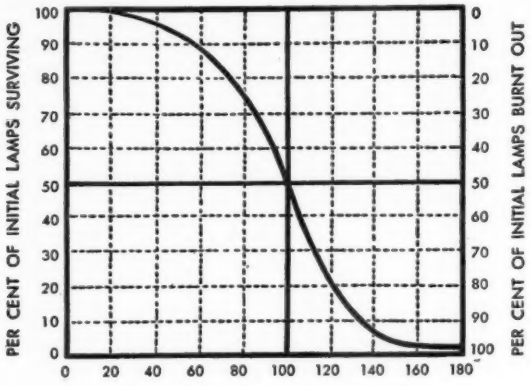
Fluorescent operating hints

No. 2 of a series published by SYLVANIA for all users of fluorescent lighting

HOW TO GET FULL LAMP LIFE

Average rated life of good-quality fluorescent lamps is 2500 hours for the 40-watt size — 3000 hours for the 100-watt size. But the life of individual lamps may vary as the chart shows:



And actual operating conditions seldom are as favorable as controlled laboratory tests. Nevertheless, these average rated life figures will help you estimate how many lamps you will normally replace every month. Simply use 2500 or 3000 hours as indicated in this formula:

$$\text{Expected lamp renewals per month} = \frac{\text{No. of lamps} \times \text{average burning hours per month}}{\text{Rated average life of lamps in hours}}$$

If your actual monthly replacements consistently exceed the calculated figure in your own formula, it will pay you to check these five factors, which shorten lamp life:

1. TOO FREQUENT STARTING: Average rated life is based on lamps operating for not less than four hours every time they are started. More frequent starting dissipates the filament coating vital to fluorescent performance — and thus shortens lamp life.

2. DEFECTIVE STARTERS: Starters that are not working properly may cause the lamp to blink off and on, a condition that also shortens lamp life. Sylvania Starters cost only a few cents and should be replaced as necessary to protect your lamp investment.

3. VOLTAGE VARIATIONS: Fluorescent lamps are made to operate within specified *ranges* of voltage — for example, 110-125 volts. Variations within the specified voltage range do not seriously affect a lamp. But at voltages much below the range, starting becomes uncertain, and there is an excessive drain on electrode material — with a resultant toll on lamp life. Above the normal range, there is also a life-shortening effect. In addition, light output also is affected by voltages outside the normal range.

4. LOW TEMPERATURE: Fluorescent lamps are designed to operate most efficiently between 60 and 90 degrees Fahrenheit. If low temperatures are unavoidable, lamps may be protected with enclosed fixtures.

5. EXCESSIVE VIBRATION: This reduces lamp life and can often be prevented or minimized.

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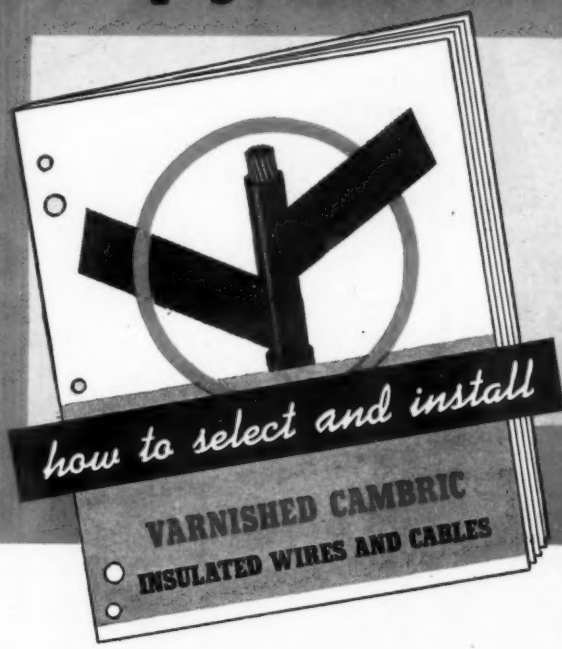
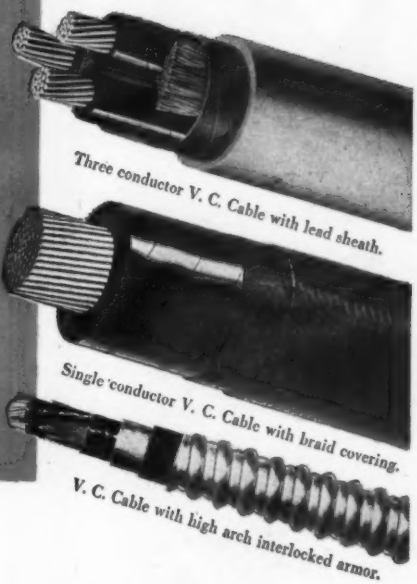
Volume 24 Number 8

This 44 page Data Book tells




Three conductor V. C. Cable with lead sheath.
Single conductor V. C. Cable with braid covering.
V. C. Cable with high arch interlocked armor.

This book answers many questions which engineers encounter today and it is yours on request, with no obligation. In addition to the 40 pages of valuable data, there is a four page supplement on "Considerations for Increased Current Loadings Under Wartime Conditions." Material includes:

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- Tables of Diameters, Weights, etc., of 1, 2, and 3 Conductor Varnished Cambric Cables.
- 4 pages on how to splice and terminate.
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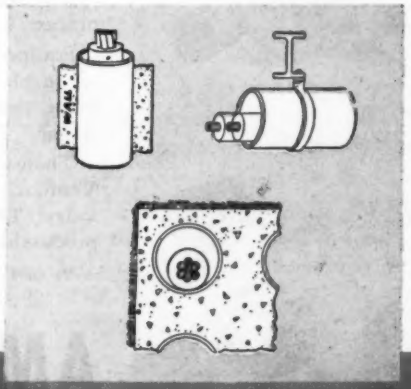

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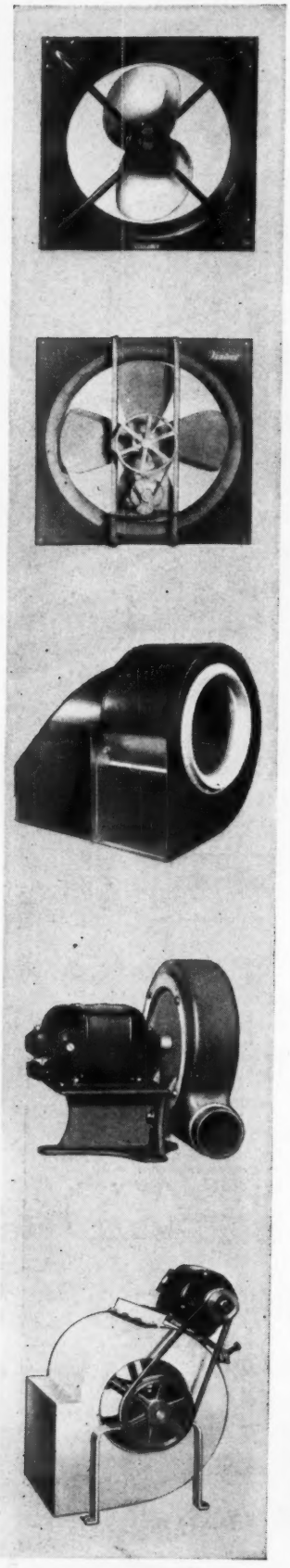

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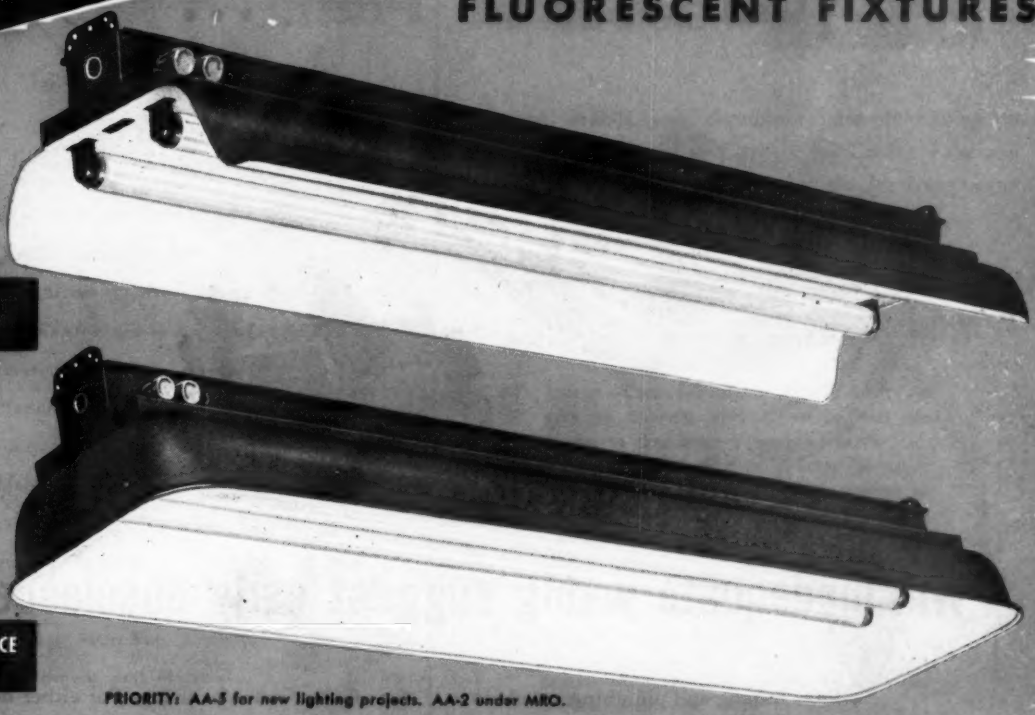

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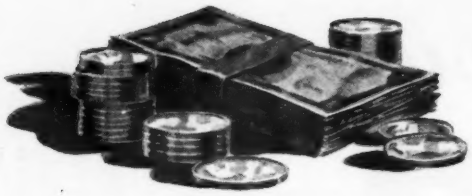
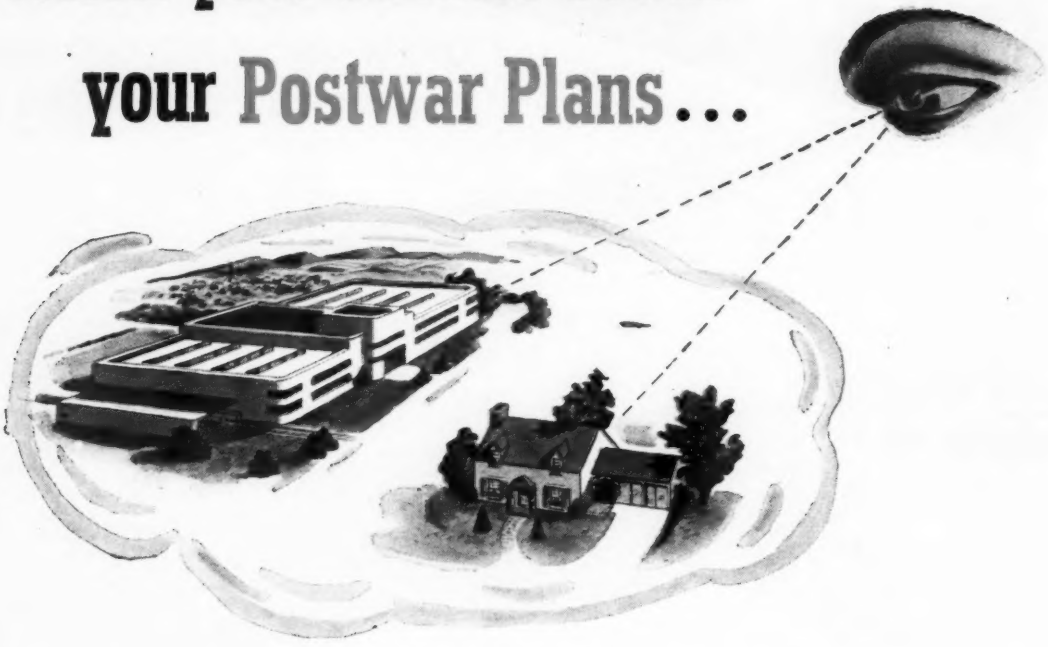


When your banker scans your Postwar Plans...



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ELECTRICAL SOUTH

VOL. 24 AUGUST 1944 NO. 8

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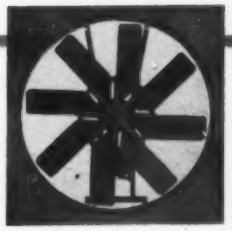

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A full description of the Coolair line, with tables showing models, dimensions, performance data, etc., can be found in SWEET'S CATALOG A.S.H.V.E. GUIDE ELECTRICAL BUYER'S REFERENCE

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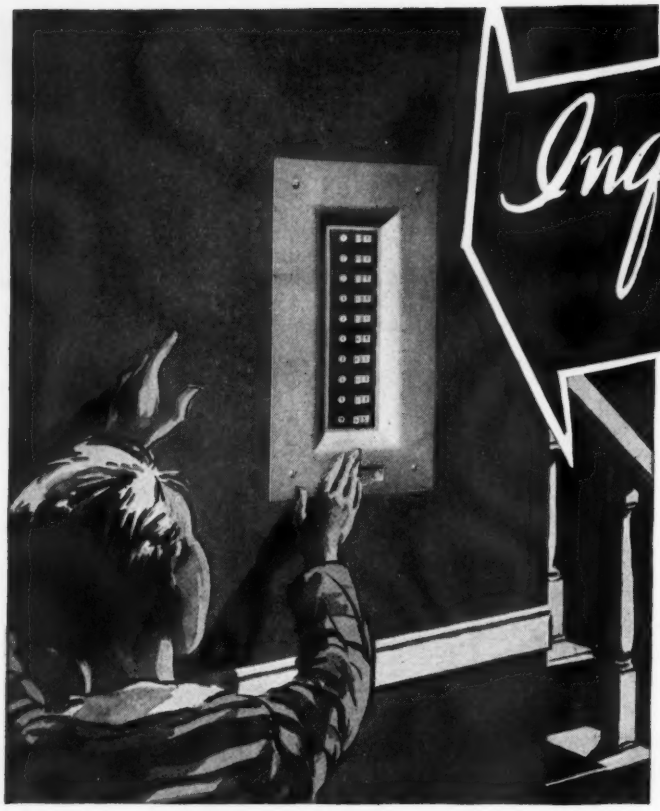

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This is the Ⓕ Type AC Thermag Circuit Breaker Unit. Capacities 15 to 50 Amp., 120 Volt AC. It combines the time-delay action of the proven THERmal trip with the fast MAGnetic trip. The circuit breakers are made in individual pole units, but can be furnished with a cross bar to operate as a double pole main breaker or branch circuit breaker with one operation, with individual trip per pole on overload or short circuit. (Circuit Breakers are NOT sold separately.)

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The home owner likes these Ⓕ Products because of their attractive pearl-gray finish, natural brown Bakelite base units and ivory toned operating handles — because they afford modern protection with ease of operation — and because of their long life. (The Circuit Breakers are Underwriters' Laboratories-tested for *ten thousand* complete operations.)

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ELECTRICAL SOUTH

AUGUST 1944

Simplifying System Layouts

By A. C. Monteith*

Part 1. — Advances in apparatus and system improvements in the past 20 years. Part 2 (Next Month)— Where to concentrate efforts to obtain maximum results.

THE ELECTRIC industry has established an enviable record in the way it has met the demands and requirements created by the impacts of war. Its performance has confounded its worst critics and surprised its staunchest supporters. But it must not rest long on these laurels. The hazards of complacency are well known. The mark of a healthy industry is its progressive growth. Precedents and customs which have reached the limits of their possibilities must be pruned out so that new growth can be stimulated by the light of new and changing conditions.

The coming of peace will bring many new problems to the industry. They will be varied but most of them will involve questions of economy in some form. The ideas set forth in this paper are presented as constructive suggestions intended to further the common interests and objectives of manufacturers as well as power companies in promoting an industry that will be a real servant both to its owners and to the country as a whole.

The steady decrease in price of electrical energy, shown in Fig. 1, is a delight to us all. It has stimulated much development in all industries. We are doing things electrically today that have made our way of life better, that would have been impossible 20 years ago.

That costs have not decreased as rapidly as prices, is somewhat distressing. There is trouble—serious trouble — ahead if the trends continue as indicated in Fig. 1. There must be a reasonable margin between cost and price of energy, if the industry is to remain virile. To increase prices will be difficult, if not impossible. Furthermore, I question its desirability, even if it could be accomplished.

The conclusion is obvious. Find methods of reducing costs. This is not easy, for reductions in cost must not be made at the expense of service reliability or by cashing some of the system reserves. A reasonable reserve capacity should be maintained for several reasons, the best of which is to withstand the impact of war and

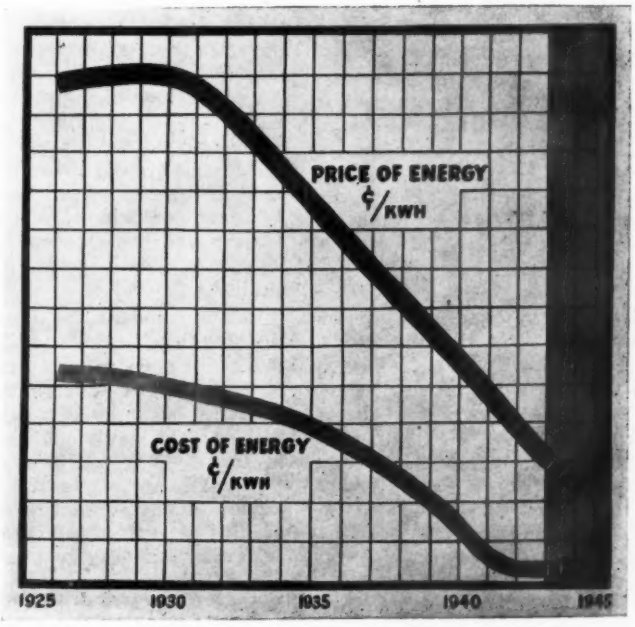


Fig. 1. Cost of electric energy has not decreased as rapidly as the price of electric service. To maintain a reasonable margin between cost and price of energy, costs must be further reduced. One method of doing this is to simplify system layouts and reduce component parts of system to a minimum.

*An address before the annual meeting of the Edison Electric Institute, in New York City, June, 1944. Mr. Monteith is manager industry and engineering for Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

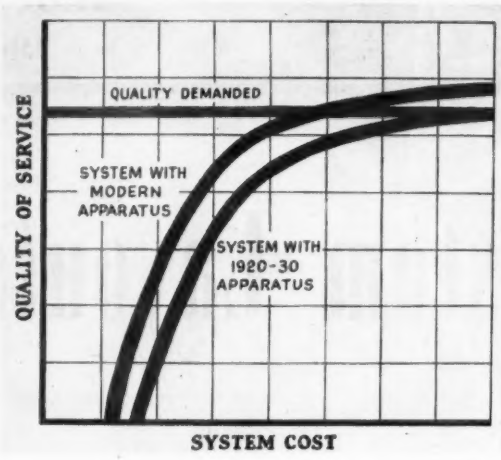


Fig. 2. How cost varies with quality of service.

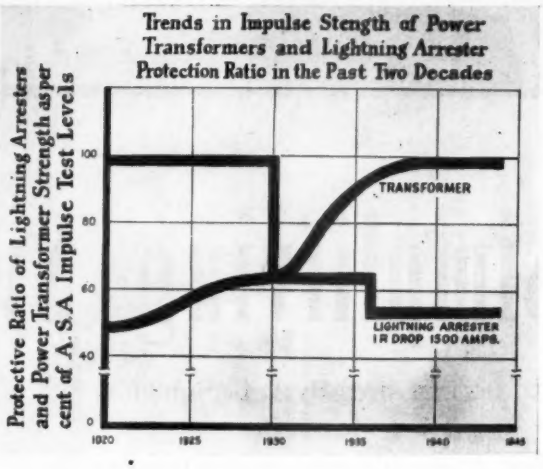


Fig. 3. Trends in impulse strength of transformers.

other emergencies, of which we have just had such a vivid example.

Methods of Reducing Capital Costs

Any reduction in capital costs will also affect maintenance, taxes and other costs that determine the overall cost of production. This discussion will only cover capital costs. Methods of reducing capital costs could be the subject of a book. A few of the chapter subjects for such a book might be:

1. Use equipment up to its economical limit of loading, especially for short-time overloads occurring infrequently in case of emergency.

2. Provide wattless capacity at the loads to derive the greatest kilowatt system capacity per dollar of investment.

3. Encourage high load-factor loads, which result in a maximum number of kilowatt-hours for a given system investment.

4. Eliminate spare equipment, where the superior reliability of modern equipment with short-time load capacity or portable equipment can be used.

5. Encourage standardization of methods and equipment to minimize designs, drawings, tools, jigs and fixtures for heavy apparatus and in addition, allow volume production when manufacturing the smaller apparatus.

6. Simplify system layout and reduce component parts of the system to a minimum. This is the chapter subject that will be discussed in this paper.

Simplifying System Layout

The possibility of simplification of system layout and component parts is of utmost importance. The public has been educated to demand a high degree of continuity of service and is so dependent on good service now that lowering the standard of service would be as difficult as increasing prices. We should, however, review the system layout now to take into account the improvements that have been made in apparatus and system designs to improve service reliability. This is important because only up to a certain point do increased costs bring improvement in quality of service. Then we reach the point of diminishing returns and costs become excessive for a small improvement in quality of service.

Let us consider the example of Fig. 2 which is drawn to illustrate this point and does not necessarily represent any particular system. In this example let us assume that for the equipment available in 1920-1930 it was necessary to put sufficient apparatus, lines, etc., into the system to get the quality of service indicated. But apparatus, line designs, and methods of operation have been improved, so that for systems with modern apparatus, the same quality of service can be obtained at much less investment. This may in many cases be an exaggerated example but it illustrates the point that full advantage of improvements in equipment should be taken when plans for changes or extensions are made. This is such an important point, that, before examining specific possibilities, we should briefly review some of the advances that have been made in apparatus and system improvements in the past 20 years.

Turbine Generators—Total outage factor has steadily decreased from 15.3 per cent in 1922 to 6.11 per cent in 1941, or maximum possible unit operation has steadily increased from 84.7 per cent in 1922 to 93.86 per cent in 1941.

Circuit Breakers—All modern circuit breakers are now tested at full published kva interrupting capacity in factory laboratories. Twenty years ago designs were based on a few field tests and experience.

Interrupting time has steadily decreased. Twenty years ago the interrupting time of high-voltage breakers was about 25 cycles. The first published opening time for oil breakers was 12 cycles in 1929. This was reduced in 1930 to eight cycles. The published interrupting time of 115-kv breakers and above is five cycles, which is approximately one-fifth of the original figure and three cycle high-voltage breakers are available.

Breakers are now rated on a 15-second duty cycle and have relatively small derating factors for fast reclosing. This is possible because interruption is accomplished with only a fraction of the arc energy and consequent gas formation. Breakers 20 years ago

were rated on a two-minute duty cycle.

High-voltage breakers can be built for reclosing in 20 cycles, a speed impossible only a few years ago. This permits economies in transmission line construction.

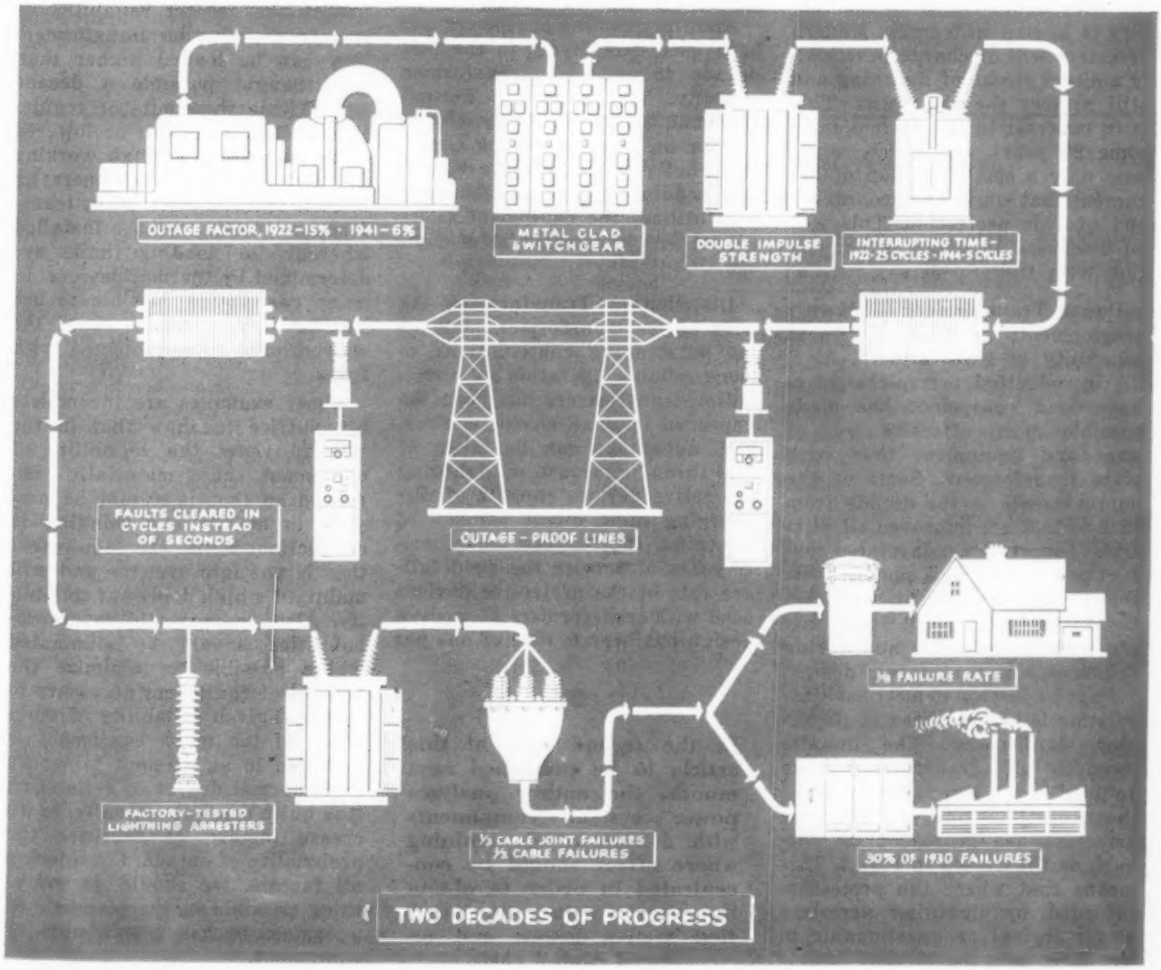
Modern circuit breakers meet the basic impulse levels. Their insulation can be coordinated with other apparatus on the power system so that uniform surge protection can be provided in the station.

Because of the greater corrosive-resisting metals and other improved materials as well as the use of more efficient arc-interrupting devices, modern breakers do not require maintenance and inspection nearly as frequently as did old breakers. Many indoor types of breakers are of the oil-less type, which minimize fire and explosion hazards.

Metal-Clad Switchgear—Standardized metal-clad switchgear assemblies are now available utilizing modern breakers and incorporating safety features from an operating point of view that were difficult to get in the ordinary assembly of substation. Where concentration of power necessitates it, the equivalent of segregated phase in metal-clad switchgear can be obtained using only a small portion of the space required for the conventional segregated-phase switchgear. Bus runs are all insulated for full voltage. These bus runs have a practically perfect service record.

System Relaying — System relaying has been improved so that, in combination with the high-speed breakers, faults can be cleared in a few cycles instead of seconds as was the case 20 years ago. Relaying systems have been made more reliable and have been improved through modern methods of application. Overall fault clearing times of as low as four cycles are possible. Fault clearing times of six to eight cycles are common.

Transmission Lines—High-voltage outage proof lines are now in operation as a result of the work done over the past 20 years. Improvements in performance can be credited largely to lowering of tower-footing resistance, more adequate shielding, and co-ordinated tower designs. High-speed clearing of faults has reduced the burning usually permitting immediate reclosure. Several lines have been in operation for 10 years with practically perfect operating records. Many lines, 66 kv and above, have had an outage record of less than one per 100 miles per year. The outage factor of one 66-kv line built in 1911 has been reduced from 45 outages per 100 miles per year to three simply by reducing tower-footing resistance. A further reduction to one outage per 100 miles per year


OUTAGE FACTOR, 1922–15% · 1941–6%
METAL CLAD SWITCHGEAR
DOUBLE IMPULSE STRENGTH
INTERRUPTING TIME– 1922–25 CYCLES · 1944–5 CYCLES
FAULTS CLEARED IN CYCLES INSTEAD OF SECONDS
OUTAGE – PROOF LINES
1/6 FAILURE RATE
FACTORY-TESTED LIGHTNING ARRESTERS
1/3 CABLE JOINT FAILURES 1/2 CABLE FAILURES
30% OF 1930 FAILURES
TWO DECADES OF PROGRESS

would result from adequate shielding.

Low-voltage outage-proof lines are possible through the use of protector tubes. In one case equipping 13.8-kv lines with tubes every second pole on all three phases reduced outages from 42 to two per 100 miles per year. Lines can also be built with spacings and conductor arrangements that lend themselves more readily to self-clearing characteristics than do older lines.

Cables—Joints in high-voltage cable have been improved so that there are only approximately one-third the number of cable-joint failures in 1940 as in 1925, whereas in the cable itself, failures are only one-half as likely as in 1925.

Network Transformers — The failures of network transformers per 100 banks per year have been reduced to 30 per cent of those experienced in 1930.

Lightning-Protection Devices—Lightning protection devices are not thoroughly tested in the factory to assure uniformity. Modern arresters will discharge practically a direct stroke of lightning and still protect the apparatus. This is in contrast to the devices built some 20 years ago which would pass only a small fraction of the current that could be encountered and provide protection. This will be discussed in detail in connection with transformers.

Power Transformers — Many developments have led to greater reliability of transformers. Also, the introduction to tap-changing-under-load equipment has made possible more effective use of lines and equipment than with plain transformers. Some of the improvements in the decade from 1922 to 1932 are improved oil, sliverless copper, paper-insulated conductors, brazed coil connections, better gums and varnishes, inert gas to protect the oil from oxygen both in operation and during shipment, and surge proof design.

Impulse testing to meet basic insulation levels has been of particular significance. The impulse strength of transformers has doubled in the last 24 years, while the protection ratio of lightning arresters has decreased by one-half, as illustrated in Fig. 3. This means that where the protection afforded by lightning arresters was marginal or questionable in the early 20's, the present protection devices limit the voltage under similar conditions to approximately one-half of the surge strength of the transformer winding. This gives a large margin of protection ability and, therefore, a much greater degree of assurance of protecting the transformer under all types of service conditions. Modern protection devices give good protection to many of the older transformers. The methods of applying protection devices are now much better understood than they were 20 years ago.

Since 1932 we have adopted such general improvements as better tank seals, stronger mechanical parts, better bracing of conductors, better insulation through vacuum filling, steep-wave front design and testing, loading by copper temperature, and the air-cooled transformer in classes up to 15 kv. The use of a relay that closely follows the thermal characteristics of the transformer, allowing maximum loading within safe limits, permits greater utilization of transformer capacity.

Auxiliary cooling equipment has been used extensively in the last decade to increase transformer capacity. This allows a normal economic selection of transformers for ordinary operating conditions but provides reserve capacity. Loading by copper temperature utilizes the equipment to its fullest with minimum risk of damage.

Distribution Transformers—As with power transformers, one of the outstanding contributions to more reliable operation of distribution transformers has been the improved impulse characteristics. Full advantage can be taken of this through the use of lightning protective devices capable of discharging most direct strokes of lightning. In 1,900,000 transformer years of service the field failure rate of the protective devices used with transformers of modern design has been 6/1000 of one per cent per year. In the last decade distribution transformer failures of all types including windings, protective devices, etc., dropped from 8/10 of one per cent failures per year to 1/10 of one per cent on a particular group of transformers.

With the conventional methods of protection used approximately a decade ago, outages could be expected on 10 to 20 per cent of transformers each year. With the more modern methods of protection that have been devised, this has been reduced to a fraction of one per cent. One company after a complete review of their transformer troubles found that 70 per cent of their interruptions in 1942 were caused by lightning. With conventional protection devices they had trouble on 15.7 per cent of their conventional transformers through fuse operations while with the more complete type of protection, without fuses, the failure rate was but 0.4 per cent.

With the greater reliability of modern distribution transformers they can be loaded higher than was thought possible a decade ago. Within the limits of regulation, system costs can be lowered quite materially through working the distribution transformers up to their thermal limit. Many transformers have been installed whereby the loading limits are determined by thermal devices. In many cases it is possible to use smaller transformers than the conventional type protected with fuses.

These examples are incomplete but suffice to show that in the last 20 years the reliability of equipment has materially improved so that it should be possible to modify our thinking in connection with the equipment that is put into systems and still maintain a high degree of reliability. Also, the pyramiding of probabilities should be eliminated where possible to minimize the amount of equipment necessary to secure a given reliability of operation. If too much equipment is installed in an attempt to secure an abnormal degree of reliability, it is quite possible, actually, to increase instead of decrease the probability of outage. Considering all factors, we should do everything possible in the planning of a system to use a minimum of equipment.

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In the second part of this article to be published next month, the author analyzes power system components with a view of determining where effort should be concentrated in order to obtain the greatest return in simplified system layout and reduced capital costs.

Postwar Appliance Purchases Charted by OCR Survey

DEMAND for consumers durable goods and appliances today is close to the levels immediately preceding the war, but a large number of families intend to use their savings for buying or building a house before purchasing durable goods, W. Y. Elliott, War Production Board Vice Chairman for Civilian Requirements, reported recently in making public the results of the Office of Civilian Requirement's third nationwide survey of consumer requirements.

In the survey, made during April by enumerators from the Bureau of the Census, buying information was sought from about 4,500 families, selected as proportionately representative of the total population.

Among eleven appliances covered in the survey, washing machines are now in greatest demand, with electric irons and mechanical refrigerators in close second and third positions. Other items covered, in the order of present consumer preference, were cooking stoves, electric toasters, radios, sewing machines, vacuum cleaners, heating stoves, electric fans, and water heaters.

Contrasting with the relatively moderate demand for appliances one out of ten of all the families interviewed said that they would buy or build a new house now if plenty of materials and labor were available.

Families reporting plans to buy or build a new house as soon as possible were asked: "Are there any reasons you can think of why you might wait a while before buying or building even if it were possible now?" A considerable number expressed reservations in response to this question, many of them saying that they might not have enough money, but enough respondents to represent 819,000 said that they could see no reason for waiting. The largest number of dwelling units ever built in one year in the United States was 935,000, in 1925, and, in recent years, 715,000 in 1941.

In announcing the survey results, Mr. Elliott said:

"The information obtained from representative families all over the country shows that the American public has conserved its household equipment and appliances

Families Who Would Buy Durable Goods and Appliances If All Were Readily Available

ITEM	Number of Respondents* Would Buy First	Number of Respondents* Would Buy Second	Estimated U. S. Total, First and Second Purchases	Total Who Would Buy Number of Respondents*	Total Who Would Buy Estimated U.S. Total
Washing machine	337	134	3,935,676	510	4,261,560
Electric iron	311	116	3,568,012	481	4,019,236
Mechanical refrigerator	304	113	3,484,452	458	3,827,048
Cooking stoves—total	235	99	2,709,904	379	3,166,924
—gas	92	50	1,186,552	159	1,328,604
—oil	58	14	601,632	80	668,480
—wood or coal	56	15	593,276	81	676,836
—electric	29	20	409,444	59	493,004
Electric toaster	195	90	2,381,460	383	3,200,348
Radio	154	89	2,030,508	321	2,682,276
Vacuum cleaner	140	76	1,804,896	286	2,389,816
Sewing machine	128	89	1,813,252	278	2,322,968
Heating stoves—total	72	34	885,736	147	1,228,326
—wood or coal	43	13	467,936	70	584,920
—gas	13	10	192,188	35	292,460
—portable electric	9	2	91,916	16	133,696
—oil	7	9	133,696	26	217,250
Electric fan	67	64	1,094,636	178	1,487,368
Water heater—total	48	19	559,852	93	777,108
—gas	24	5	242,324	40	334,240
—electric	14	5	158,764	31	259,036
—wood or coal	9	6	125,340	17	142,052
—oil	1	3	33,424	5	41,780

*Of the 4,488 households interviewed.

and the present demand for these items is largely for legitimate replacement needs or from households which now need appliances they did not have before the war.

"Generally speaking, people have accepted the wartime lack of durable goods and appliances without complaint, and this survey indicates that when such goods become available again, there should be an orderly market rather than the wild buying rush which some people have predicted. When it becomes possible to release materials and facilities for the production of consumers durable goods, the programs of the Office of Civilian Requirements, aimed initially to take care of minimum essential needs, should provide a smooth transition back to the normal condition of unrestricted supply. The survey results indicate that the American public will follow a sensible buying policy instead of creating a sudden boom market, which might lead to an equally quick collapse.

"The very high level of demand for new houses points toward a market in the construction industry which should remain strong over a considerable period of years. Not all of those who have indicated a desire to buy a new house will purchase one which is newly built, but many are anxious to do so. After they have their houses, they will then provide a further market for durable goods to go in them.

"The Office of Civilian Requirements is concerned only with supplying essential needs during the changing conditions which will arise while the war is still going on. The picture of demand provided by this survey is highly encouraging as to the willingness of the public to restrict their demands to real needs until the war is over."

44% Would Make Purchases Now

Among all of the 4,488 households interviewed, 44 per cent said they would buy one or more of the listed appliance items at once if they were available, while 56 per cent said they would not buy any of these items immediately, even if there were plenty of all of them in the stores.

For each of the appliances listed, respondents were asked whether they had tried unsuccessfully to buy the item during the last year, how much difference it made to them if they had failed, and finally, "Would you buy a new one right away if there were plenty of everything in the stores?" Those who said they would buy more than one of the items were asked to indicate a first and second choice. The total demand figures are shown in the table.

The table shows the demand only from households that would purchase the items for their own use. For some of the items, such as refrigerators and stoves, this demand may be substantially increased when they are readily available by purchases which apartment house owners and landlords generally might make for the benefit of their tenants, Mr. Elliott said.

In estimating the total active demand from the survey results, the most realistic figure is probably the total of first and second choices for each item rather than the total number who say that they would buy if the item were available, he said. Even on the first choices a considerable number of the respondents indicated that they had some reservation about their buying intentions, and it is improbable that many families would buy immediately more than their first and second choice item, Mr. Elliott added.

The families that said they would buy or build a new house at once if materials and labor were available were asked whether they had discussed the plans about how much they expected to spend for a house, whether they had actually done anything about it, and whether on reconsideration there were some reasons why they might wait a while before buying or building. Ninety-one per cent of the members reporting new house plans had discussed them with the family and 71 per cent had actually saved money that they intended to use for a house.

However, 78 per cent reported reservations about their plans when asked whether they might wait a while. The other 22 per cent expressed no uncertainty about their plans.

All of those who said they would buy or build a new house were asked how much they expected to spend for it. The answers showed considerable variation, but the average cost expected was $4,412.

Most of the families reporting that they would buy one or more appliance items immediately would buy out of current income. A total of 76 per cent said that they would buy out of earnings (45 per cent) or on installments (31 per cent). Only 18 per cent indicated an intention to use savings to buy the item they wanted. The others said "It depends" or "Do not know." The total number who would buy out of savings does not vary greatly from item to item but, as might be expected, the number who would buy on installments tends to increase as the item becomes more expensive. Thus 57 per cent would expect to buy a wood or coal cooking stove on installment while only 4 per cent would want deferred payments to buy an electric toaster.

56% Will Not Buy Immediately

Among the 56 per cent of all families interviewed who would not buy any of the appliance items immediately, 77 per cent said either that they did not need the item or that they had one in satisfactory condition, and 12 per cent said they did not have enough money. Only one per cent of this group gave waiting for improved models as a reason for postponing purchase.

The 44 per cent who would buy one or more items right away if available were asked, in reference to their first choice, "Are there any reasons you can think of why you might wait a while before buying, even if there were plenty now?" Sixty-two per cent said they had no reason for waiting, while 38 per cent expressed some reservation when thus asked to reconsider their buying plans. The most important reservation, accounting for about half the total, was that they might not have enough money or prices might be too high. Another quarter of those who wanted to buy but had reservations said that they might wait for an improved model. Tabulations of these reasons for expressing reservations are not yet available item by item.

The families expressing a desire to buy one or more of the items if plenty were available were also asked why they needed the first-choice item at once. For all first choices, regardless of item, 42 per cent said they needed a new one because their old one was unsatisfactory and 56 per cent wanted the item because they did not have it. These percentages varied considerably from item to item. Among those for whom

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Veteran Texas Dealer Looks Ahead

Sees changed pattern of operation among independent appliance dealers. No outside sales force is planned for the postwar period.

By Chas. N. Tunnell

WHEN A sales force declines from 23 outside electric appliance salesmen to two inside executives and a woman assistant, it might seem that the business is well on the way out . . . but such is not the case with the Lansdowne & Moody Company, 2900 Main Street, Houston, Texas. It is true that this firm doesn't have any outside salesmen — there aren't even any floor salesmen except Mr. Lansdowne and his assistant, but this appliance dealer is not only in business but what is more important, is making money!

The Lansdowne & Moody firm was established in 1936. Mr. Moody, an attorney, has been inactive for the main part, but G. U. Lansdowne is an experienced electric appliance merchant. Before the war, this firm was known as an aggressive organization with a fine record in refrigerators, ranges, irons, attic ventilation, and fans. The firm was also frequently referred to as "America's No. 1 Bendix washing machine retailer," for just about one-half of the 5,000 Bendix units in use in the Houston area were sold through this firm.

Business during this war period has been no bed of roses for Lansdowne; neither has it been impossible. He pulled in his operations in many lines; he expanded in others. In other words, this firm became very versatile by merchandising anything that would keep the business operating at a profit so long as the merchandise was of suitable quality. In fact, the Lansdowne & Moody Company was said to be the first firm in America to build an economical food dehydrator to retail at a reasonable price. This firm developed a model; had contractors build this home dehydrator, and sold 12,000 of these units before competition really got started in the field.

When dehydrators had begun to run their course, Lansdowne began to have wooden toys made in his service shop and to sell a few toys just to develop the idea. Then he went after this business on a big scale by contracting to furnish merchandise to large toy outlets. When he saw he couldn't get sufficient wood workers and contractors in a war working city like Houston, he went to four small Texas farming towns and found men with wood working shops who could make his wooden toys. Lansdowne & Moody sold over 300,000 of these wooden toys in 1943.

But while bolstering volume with these various sidelines, this electric appliance firm kept right

G. U. Lansdowne, manager of Lansdowne & Moody, Houston, is demonstrating to a group of young housewives and future housewives how to use the dehydrators his company built and sold when electrical appliances became scarce for his two stores. However, Lansdowne is an electrical merchant and plans a postwar all-electrical store that will be a show place of Houston.

on plugging for business in the electric field. Although the big domestic attic fan business was out for the duration to a large extent, a lot of fans have been sold for commercial use.

"All commercial firms can qualify for a AA-5 rating for fans," says Lansdowne, "so we have sold a lot of these fans. One manufacturer alone has paid us $12,000 this year in commissions on fans sold mainly to war plants and commercial outlets. Most war plants and commercial firms are not shopping for prices today — they want to know if we have the merchandise. For example, one firm just recently telephoned for ten fans; we quoted our list price and the executive mailed in the purchase order without further shopping or asking for any quantity discount such as would have been the case prior to the war."

Although some attic fan people have used substitutes in making fan blades, have substituted different size motors, etc., this dealer says, "We have refused to sell anything that we can't be proud of. We passed up a lot of attic fan business for residences just because we didn't have what we believed would stand up. We have also passed up a lot of stove business because we have refused to carry any tin stoves. We have sold what few we could get in quality material — and now that the stove picture is clearing up, we believe we will profit in the long run. We have passed up some business, but we have sold our limited number of good stoves, and now that restrictions enable manufacturers to make regular size and type stoves again that will be available, most people will wait for these better models and they will have more respect for the dealer who has advised them all along against buying poor merchandise."

Service on Profitable Basis

A service man is paid a good salary at the Lansdowne & Moody store to service mainly the appliances that have been sold by this firm: automatic washers, refrigerators, irons and such appliances. This dealer explains, "We probably service half of the Bendix washers in the city and we make a profit on this part of the service. We were fortunate in increasing our minimum service charge on washers in 1941 from $1.50 to $2.50 before the price freeze. We figure a serviceman can make at least eight calls per day—especially on washers. Many of the washer calls require only about five minutes of service time for most such calls are the result of a bobby pin being left in a sheet or failure to turn out the pockets of garments, and so on.

"We make a profit on washer service, but we don't make a profit on refrigerator service. About the only refrigerators that require service are the old ones that are too far gone or the ones that are dead. However, we believe in the postwar period many refrigerators will also come equipped with 'quick freeze compartments' and the two distinct temperatures required in one unit will need more service. The refrigerator dealer of tomorrow will have to maintain or be connected with a good service organization."

While the Lansdowne & Moody organization cannot handle all service calls, they give a friendly and sympathetic hearing to all such calls. A list of service shops and their telephone numbers is kept by the telephone and when a woman calls in about repair on an electric iron, radio or a refrigerator that this firm does not service, these merchants don't dismiss the prospect with a cure, "We don't repair these units." One of the three people who handle these calls courteously explains that the customer can probably get the repair done at such and such a shop, naming the telephone number of this shop.

"We may not always have anything to sell and we may not be able to repair a particular article, but we can at least render a personal service," reasons this appliance merchant. His policy has won friends, for it is not unusual for him to get letters commending his courteous, personal service.

Several years ago, Lansdowne & Moody opened a branch store in Houston to handle commercial refrigeration. This store is now located at 2212 Texas Avenue — but like the main store, it too has been versatile in its lines to adapt stocks to changing conditions. Ford-Ferguson tractors have been added and a good business has been built up with rice farmers. Although the farm tractor quota for this firm was 35 for 1944, more than 100 of these small tractors have already been sold, the quota overage going into war plants and such industries with a AA-1 priority rating.

In addition to tractors, dairy equipment, etc., this branch store, which is managed by E. E. Earp, has sold seven to eight carloads of electric water coolers since taking on this line. At first a carload of electric water coolers was bought to sell to war industries, then others were bought to supply navy requirements for ships, etc., these latter coolers being for direct current.

Although the Lansdowne & Moody company will sell toys or anything else in the way of good merchandise to remain active during this war period, plans are in the making for a big postwar business in the electric appliance field. It is definitely known that two lines of electric refrigerators will be carried, probably three; and plans are under way for a big volume of quick freeze units.

Quick Freeze Units Studied

Lansdowne says, "We and other appliance merchants will do a big business in quick freeze units for the farmers will buy large units, and even the rural and city people with food locker space will buy these quick freeze units to avoid having to make frequent trips to the locker. These units will sell from $150 to $750 each, but price will be no object for several years to come. However, we don't believe that dealers will be able to hit the full stride in refrigerators and quick freeze units for much longer than one year after victory for manufacturers have to build up stocks and they are also going to take care of some export business along with the domestic sales. But electric dealers of all types will fare well.

"Here in our main store we are going to have an all-electric store carrying every kind of appliance from electric razors to big quick freeze units, fans, etc. We are going to employ both men and women and all sales will be store sales on a commission basis. We do not plan to have any outside bell ringers and believe it will be several years before there are any more house-to-house salesmen. Now if one of our sales clerks wants to go by a prospect's house at night to close a sale, that will be a different story. But we are not going to have the outside crew

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Temperature Control Service Problems

REFRIGERATOR temperature control service problems encountered in servicing General Electric and Hotpoint refrigerators can be divided into two general classifications: (1) service troubles which will not permit the machine to start, and (2) service troubles that result in unsatisfactory refrigeration and erratic operation.

In servicing temperature controls, the service man should, wherever possible, refer to the manufacturer's service manual covering the specific model of refrigerator and temperature control that is being serviced. Although control mechanisms were improved considerably in the last few years that refrigerators were manufactured, and although several different types of controls will be encountered such as the two-knob controls, single-knob controls, and Constant Cold controls, all of these operate on the same basic principles. The following discussion will therefore apply generally to all types of control found on these models except where reference is made to some particular type of control.

Trouble from Weak Bellows

When a machine will not start, the cause is frequently a weak bellows. The reason for this is that a weak bellows, one that has lost all or nearly all of its gas charge, offers little resistance to the pressure of the temperature spring. Consequently, the contact will be kept open and the machine will not start. During the time when a bellows is losing its charge, there will be a period when the amount remaining is right on the borderline for operating the bellows arm. When this condition exists, the control will sometimes trip on and start the machine and other times it will not.

If the knob is turned to a colder setting when the bellows is in this condition, the control will function all right for a while until more of the gas charge is lost and erratic operation occurs again.

A weak bellows can be checked by removing the control cover and, with the bellows tube warmed up to room temperature, pressing on the bellows arm toward the bellows. The pressure should be applied near the center of the bellows arm so as not to bend it. If the bellows is weak, it will offer little resistance. A weak bellows should be replaced. When the service job is being done in the home, it is generally more convenient to replace the control and then change the bellows in the shop.

In hot, humid coastal areas, bellows failures have been somewhat more frequent than elsewhere in models where the control is mounted across the front of the evaporator. In order to reduce these failures, design changes were made which included coating the bellows with aluminum varnish and recessing the control cover. In such areas, only controls with these improvements should be used for replacement purposes.

Another cause for a machine not starting is a broken terminal bar. High humidity conditions may cause corroding and breaking of the early type, unplated brass terminal bar which carries the current from the terminal not connected to the stationary contact to the post to which is joined the overload heater in two-knob controls and the movable contact arm pigtail in single knob controls.

This trouble is quite infrequent but has been noted in apartment house installations where the refrigerator is run only over the week-end and trays of water are left in the evaporator. With the cabinet door closed, the humidity within the cabinet becomes very high. The plated type terminal bars appear to eliminate this possibility.

In the case of single-knob controls, when the machine will not start at times, the trouble may be that the "on and off" lever binds on the knob shaft. The on and off lever is an extension of the movable contact arm. It passes through an opening in the control case close to the knob shaft. A projection on the under side of the knob moves the lever and keeps the contacts open when the knob is turned to "off."

Once in a while a lever will rub against the knob shaft and will hold the main contact open, especially when the knob is at one of the warmer positions. The control operation is apt to be erratic. At times the control functions all right, at other times it does not trip back on after cutting off at the end of the cycle. Touching the knob or jarring the machine such as when closing the cabinet door may cause it to operate normally again. Also, turning the knob to one of the colder positions often eliminates the trouble.

The rubbing can be observed by removing the knob. There should be a clearance of at least 1/32 inch with the movable contact arm as far out on its post as possible. The lever may rub on either the front bearing shoulder or the rear one within the case. In the case of controls with recessed covers, an examination can be made for rubbing without removing the knob. The movable contact arm can be lifted as far as possible on its post and moved back and forth to check for interference. By placing the end of a screwdriver under the lever just before it goes through the case and forcing the outer end of the lever down, the proper clearance can be obtained.

Bridle Arm Catches on Stop

Another service difficulty which will prevent the machine from starting results when the bridle gets caught on top of one of its stops. This may occur if there is excessive movement of the movable contact arm on its post which may be due to a warped cover or the cover screw not being drawn down tight enough. If the bridle arm gets caught on the top toward the knob side of the control, the contacts will be held open and the machine will not start. A slight jarring of the control, or even a slight movement of the knob, may cause the bridle arm to jump back into place.

This condition can be checked by removing the control and rapping it with the cover down against the open hand. The bridle will jump up on one of its stops if this defect is present. A bulge in the sides of later production bridles was made to eliminate this

trouble. The usual remedies include replacing a warped cover, properly tightening the cover screw, inserting a very thin washer on the post above the movable contact arm, being careful not to interfere with the movement of the arm, and as a last resort, replacing the control.

Another possible service difficulty which will prevent the machine from starting results from the movable contact arm binding on the bearing surface on the cover so that the contacts are held open and the machine will not start. This condition is most likely to occur in controls whose cover is held on by a screw, especially where, after the cover has been removed, the screw has been drawn down too tight. The trouble can generally be corrected by loosening the screw a little or by eliminating some other source of binding.

In the case of two-knob controls, a machine which trips during normal operation may be found to have a defective solder-pot overload device. The shaft of the rachet wheel is held stationary in its sleeve by a drop of solder. If there is insufficient solder, the shaft may rotate within the sleeve so that the overload will not reset, or it may allow the overload to trip on normal or only slightly more than normal current. In such a case, the control must be replaced. The service man is cautioned not to attempt to resolder the parts with ordinary solder.

Service Troubles That Result In Unsatisfactory Refrigeration

Service troubles included in this classification are such that they will permit the machine to operate but the operation will be erratic and refrigeration will be unsatisfactory. The symptoms encountered will be such as partial or complete defrosting during off part of cycle, cabinet too cold and machine short cycles, cabinet too cold and machine runs all the time, etc. In such cases, the symptom is an important guide to the service trouble.

Partial or complete defrosting during off part of cycle may be the result of a partially weak bellows. After a bellows has lost part of its gas charge through a minute leak, a time is reached when the amount remaining in the bellows tube all vaporizes before the cut-on temperature is reached. The bellows will then expand at a much slower rate and the temperature at which the control trips on will be higher than normal. As more gas leaks out, the cut-on temperature will gradually go up.

The most likely symptom to be observed is more and more defrosting of the header during the latter part of the off cycle. Both the on and the off period will be longer than normal. This condition gets worse and worse until the whole evaporator may run on a defrosting cycle. During the time the trouble is developing, the ice freezing rate gets slower and slower and the cabinet air temperature gradually goes up.

In the early stages of the trouble, the defrosting can be eliminated by turning the knob to one of the colder positions. For a time, the operation will be normal but, as more gas leaks out of the bellows, the defrosting will return.

Opening the control and pressing on the bellows arm will not show up a partially weak bellows because there is enough pressure to make the bellows appear reasonably strong. The only way of taking care of a complaint of this nature is to replace the control, after first checking other conditions in the machine which might cause similar defrosting.

A partial or complete defrosting during the off part of the cycle may be the result of the bellows arm hitting the defrost bellcrank. At the instant the movable contact trips closed, there should be clearance between the bellows arm and the defrost bellcrank. If the bellows arm hits the bellcrank before tripping on, the upper temperature will be raised several degrees. It is quite possible that the trip-on temperature may be 32 degrees F. or above. Partial or complete defrosting of the evaporator will occur during the latter part of the off cycle, and both the on and the off parts of the cycle will be abnormally long.

If the bellows arm is bent only a relatively small amount, such as by pushing on the bridle spring end when the bellows is warm, it is apt to hit the defrost bellcrank before tripping off. The bridle spring end of the bellows arm should be parallel to the bellows end. If not parallel, the bridle spring end can be straightened with a pair of thin-nosed pliers.

In two-knob controls, check the movement of the defrost bellcrank and the cam on the main switch that moves the bellcrank. In single-knob controls, make sure that the brass bellcrank is on its post and that the post is solid in the case.

Other Service Troubles Requiring Mechanical Adjustments

When the cabinet is too cold and the machine short cycles, it is possible that the bellows arm is hitting the tail on the movable contact arm. At the instant the movable contact trips open, there should be clearance between the bellows arm and the tail on the end of the movable contact arm which projects down toward the bellows. This tail is designed to allow the bellows arm to exert force on the movable contact arm to push the contacts open should they stick or weld together. This tail was eliminated from controls used on 1942 machines with enameled evaporators.

Interference between the bellows arm and the tail on the movable contact arm just before tripping off will cause short cycling. The on period may be a minute or less and the off period a matter of only two or three minutes. The running time will be much more than normal and the cabinet air temperature will be colder than it should be. It will generally be found that the control contacts are pitted and burned quite badly when this condition exists. The complaint may originate from radio interference caused by the very frequent operating and arcing of the contacts. A control with this fault should be replaced.

In the case of single-knob controls, a cabinet that is too cold, resulting from a machine running all the time, may be the result of the bellows arm being caught under the defrost bellcrank. Once in a while, a control may be found where the bellows arm gets caught in this manner when the knob is turned to "defrost." The contacts will remain closed, the machine will run all the time, and the cabinet air temperature will get too cold.

This condition can be caused by the bellcrank slipping off the end of its post due to a warped cover or a missing locking clip. It may be caused also by the post being loose in the control case or as a result of improper forming

(Continued on page 61)

Inspectors' Annual Conference Will Be Held in Atlanta

THE outstanding feature of the sixteenth annual meeting of the Southern Section, International Association of Electrical Inspectors, will be the opportunity this meeting provides for proposing and discussing revisions of the National Electrical Code. The electrical committee, of the National Fire Protection Association, has given September 30, 1944, as the latest date for acceptance of proposed revisions for the 1945 edition of the National Electrical Code. Since the Southern Section meeting will be held in Atlanta on September 25, 26 and 27, this meeting will be about the last opportunity for members to submit proposed code revisions.

The 1945 revision of the National Electrical Code will be one of the most important in many years. Because the manufacture of many items has been discontinued during the war period, there is a much better opportunity than would ordinarily be the case to revise code articles that are closely related to the design of electrical fixtures and equipment. Also, there are many problems that have developed during the wartime emergency period that will require proper treatment in the code. For example, there is the matter of conductor ratings and conductor insulation. The 1940 revision of the code with its change in conductor ratings and recognition of many new types of insulation introduced many controversial features. Since the war started a number of new synthetic insulations have been introduced and a place for these will have to be found in the code.

There are many problems that have been in existence for some time and need further consideration in revising the code for 1945. For example, the grounding of portable appliances and equipment still needs attention, especially in dwelling occupancies where electrical fatalities occur from time to time. Many code experts do not feel that proper overcurrent protection to ordinary branch circuits is provided by the present code. This problem has been intensified by the extensive use of flexible cord wiring in houses that have not had the proper number of outlets.

Committee Reports Emphasized

Because of the importance of this meeting, article committee members have been requested to give unusual attention to their assignments and committee chairmen have been requested to submit reports in triplicate in order to facilitate stenographic reporting of the meeting. This is especially important in view of the fact that proposed revisions for code must be submitted just a few days after the Southern Section meeting.

A. M. Miller, secretary of the Southern Section, has pointed out that the April 1943 Code Supplement, the article committee report as included in the July 1942 *News Bulletin* and subsequent issues of the *News Bulletin* containing reports of Special Committees, Interim Revisions, and Official Interpretations, together with 1944 Article Committee Reports during the progress of the meetings, will supply the basis for most of the discussions at the Southern Section meeting. Members are urged to bring these publications with them as additional copies are not now available.

Because so much interest has been indicated in the code panel discussions conducted by Frank G. Camus, city electrician, of Shreveport, La., at past meetings of the Southern Section, these discussions will again constitute a special feature of the 1944 meeting.

The panel of experts who preside over these special sessions will include, in addition to Mr. Camus, L. F. Adams, General Electric Co., Schenectady, N. Y.; M. M. Brandon, Underwriters Laboratories, Inc., New York City; Dewey L. Johnson, president, Southern Section, Atlanta; Jas. D. Lynett, president, IAEI, New York City; A. R. Small, president, Underwriters Laboratories, Inc., Chicago; E. C. Knox, first vice president, Southern Section, Miami; Victor H. Tousley, secretary-treasurer, IAEI, Chicago; B. Z. Segall, New Orleans Public Service Co., New Orleans; Frank Thornton, Jr., Westinghouse Electric & Mfg. Co., East Pittsburgh; and a representative of the National Electrical Contractors Association who will be named later.

These panel discussions will enable contractors, industrial maintenance electricians, inspectors, and all other branches of the electrical industry interested in the application and interpretation of the National Electrical Code to obtain expert opinion on the many problems that confront the electrical industry as a result of material shortages, overloading of equipment, temporary installations, and so on.

Members of the Southern Section have been asked to submit their code problems and questions to the panel chairman, Mr. Camus, at the earliest possible moment. A convenient form is included on the next page to facilitate the submission of questions and problems.

The tentative program follows.

Monday Morning, Sept. 25

Registration of members and guests.

Call to Order—Dewey L. Johnson, president, Southern Section, IAEI, Atlanta, Ga.

Invocation—Dr. Louie D. Newton, pastor, Druid Hills Baptist Church, Atlanta, Ga.

Address of Welcome, Honorable William B. Hartsfield, mayor of the City of Atlanta, Ga.

Response to Address of Welcome, W. A. Stall, senior past president, Southern Section, IAEI, Jacksonville, Fla.

Presentation of President's Gavel, Paul L. Muller, junior past president, Southern Section, IAEI, New Orleans, La.

President's Address, James D. Lynett, International president, IAEI, chief electrical inspector, New York, N. Y.

President's Address, Dewey L. Johnson, president, Southern Section, IAEI, superintendent of electrical affairs, Atlanta, Ga.

Reports from the International Association — Victor H. Tousley, secretary-treasurer, International Association of Elec. Inspectors, Chicago, Ill.

Report of Secretary-Treasurer, A. M. Miller, secretary-treasurer, Southern Section, Richmond, Va.

Report of the Executive Committee—George Welman, chairman, New Orleans, La.

Report of Electrical Committee Representatives, N. E. Cannady, member, Raleigh, N. C., J. G. Fisher, alternate, Jackson, Miss.

Reports of Chapters, Florida, Georgia, Louisiana, Mississippi, North Carolina, Texas, and Virginia.

Appointment of Committees, President Johnson.

Monday Afternoon, Sept. 25

Impromptu Introductions and Addresses.

Report of Postwar Committee, George Welman, chairman, New Orleans, La.

Report of Papers Committee, F. G. Camus, chairman, Shreveport.

Report of Committee on Fuse Tampering, C. V. Reynolds, chairman, Savannah, Ga.

Postwar Committee on Inadequate Installations, E. C. Knox, 1st vice president, Southern Section, Miami, Florida.

Reports of Article Committees (continued.)

Code Panel Discussion.

Tuesday Morning, Sept. 26

Code Breakfast.

IAEI Postwar Committee on Substitute Materials and Methods, M. M. Brandon, Underwriters Laboratories, New York.

Report of Committee on Interior Network Distribution Systems, L. F. Adams, General Electric Co., Schenectady, N. Y.

Reports of Article Committees (continued).

Postwar Education and Adjustments of Electrical Workers, Marion H. Hedges, director of research, International Brotherhood of Electrical Workers, Washington, D. C.

Tuesday Afternoon, Sept. 26

Code Treatment of Infra Red Drying Equipment, Report of IAEI Technical Subcommittee, H. N. Pye, Atlanta, Ga.

Report of Article Committees.

Code Panel Discussion.

Wednesday, Sept. 27

Tips to Electrical Inspectors, E. C. Knox.

Code Treatment of Electric Welding, B. Z. Segall, New Orleans Public Service, New Orleans, La.

Completion of Article Committee Reports.

General Code Discussions and Proposals.

Executive Committee Meeting.

Report of Resolutions Committee.

Report of Nominating Committee.

Election and Installation of Officers.

To Get Your Question Discussed, Write It Below and Mail at Once to the Code Panel!

Mr. Frank G. Camus
Chairman, Code Panel
City Hall, Shreveport, La.

Dear Mr. Camus: Please have the questions below discussed at the Annual Meeting of the Southern Section, IAEI:

_____

_____

_____

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_____

_____

Name _____

Address _____

This form may be used to suggest questions on application and interpretation of the National Electrical Code for use during the Code discussion periods at the forthcoming meeting of the Southern Section, I.A.E.I. The panel of Code experts who will supervise this portion of the program will give consideration to questions on the Code submitted to Mr. Camus.

Official Interpretation of National Electrical Code

The following official interpretations of various sections of the National Electrical Code were reported recently by Victor H. Tousley, secretary of the International Association of Electrical Inspectors.

Sections 3249 and 3370. Thermal Insulation of Walls. Interpretation No. 254. Issued April 28, 1944.

Question: Was it the intent that sections 3249 (Article 324) and 3370 (Article 336) be interpreted as applying to the use of the newer types of thermal insulation in the shape of batts or blankets installed within wiring spaces but maintained at least one inch from conductors or cables?

Finding: The use of the batt form of insulation was not considered when these sections were adopted.

Section 4323. Intermittent and Similar Duty. Interpretation No. 255. Issued May 17, 1944.

Question (a): Is it intended that motors driving extractors and tumblers in laundries be considered as used for intermittent and similar duty and protected against against overcurrent by the branch-circuit overcurrent protective device as provided in section 4323 of the 1940 edition of the National Electrical Code?

Finding: No; this section is intended to apply where the driven apparatus is of such a nature that the motor cannot be operated for more than short periods, or if operating continuously the load can be applied only for short periods. Under these conditions, service heating of the motors or of the conductors cannot be excessive.

Question (b): By whom is it determined that the requirement for service by a motor is continuous, intermittent, periodic, short-time, or varying?

Finding: The authority enforcing the Code.

Section 4402. Disconnecting Means to 150 Horsepower Motor. Interpretation No. 256. Issued June 7, 1944.

Statement: A 150 horsepower synchronous three-phase, 220-volt, 60 cycle motor, Code letter E, has auto-transformer reduced voltage starting with running overload protection, full load rating 320 amperes. According to Table 26 the maximum rating of overcurrent device for the motor branch circuit is 200 per cent of the full load rating of the motor.

Question 1: May a general-use type knife switch be employed as the disconnecting means for the motor and its branch circuit?

Finding: Yes, see paragraph c of section 4402; see section 4403 for carrying capacity of switch.

Question 2: May fuses be employed for overcurrent protection of the branch circuit?

Finding: Yes, if the largest available size of fuse (600 amperes) will permit the motor to start under all operating conditions; time-lag fuses are permissible.

Question 3: May a circuit breaker of suitable current rating serve as a disconnecting means as well as for the motor branch circuit overcurrent protective device?

Finding: Yes, if the requirements of the Code for both purposes are satisfied.

Section 6034-a. Terminals and Receptacles for Gas Tubing. Interpretation No. 257. Issued June 1, 1944.

Question: May the sheet metal of a sign structure or metallic supporting frames of signs be used in whole or in part as a conductor in the secondary circuit of high voltage electric signs or fixtures?

Finding: No, paragraph a of section 6034 expressly prohibits contact with terminals of gas tubing with grounded metal whether enclosed or not. Consequently the conductor from a terminal must be insulated.

Section 5014-b. Sealing Compounds. Interpretation No. 258. Issued June 9, 1944.

Statement: A group of fueling pits at an airport is located out of doors well detached from any building. Fuel pumps and control equipment are installed in each pit. The conductors supplying the motors are in conduit within the pits, and in fibre ducts between pits and also between the first pit and the point within the building 60 feet distant at which they are supplied and controlled. The conduit is cut off outside of this building and within each pit by means of pull boxes each filled with sealing compound.

Question: Does this subdivision of the conduit raceway satisfy the requirements of section 5014-b, items 1, 2, and 3?

Finding: Yes, if the sealing compound is approved for the purpose.

Section 5020. Lighting Fixtures. Interpretation No. 259. Issued June 12, 1944.

Question: Is it permissible to use vaportight lighting units in outdoor open-type structural steel structures with grating floors, wherein are located vessels and piping containing flammable hydrocarbons? Also, on platforms adjacent to walkways or on connecting vessels and/or buildings wherein flammable hydrocarbons are stored or handled? If so, under what circumstances, if any?

Finding: It has not been the intent of the Electrical Committee that so-called vaporproof or vaportight lighting fixtures be recognized as providing the safeguards intended for explosion-proof equipment such as is specified in section 5020. Reference is made to Interpretation No. 227, the finding of which reads:

"Section 5001 contemplates that the authority enforcing the code shall determine when a particular premises or installation of apparatus conforms to the code description of a hazardous location. Generally speaking, close proximity to a bulk station warrants classification of an electrical equipment as in a hazardous location."

Section 3372. Metallic Outlet Boxes. Interpretation No. 260. Issued June 9, 1944.

Question: May metallic outlet boxes be employed when the wiring method is as per section 3372 (Interim Amendment No. 43) if insulated sleeving is used over the exposed ends of the uninsulated grounded neutral conductor.

Finding: No.

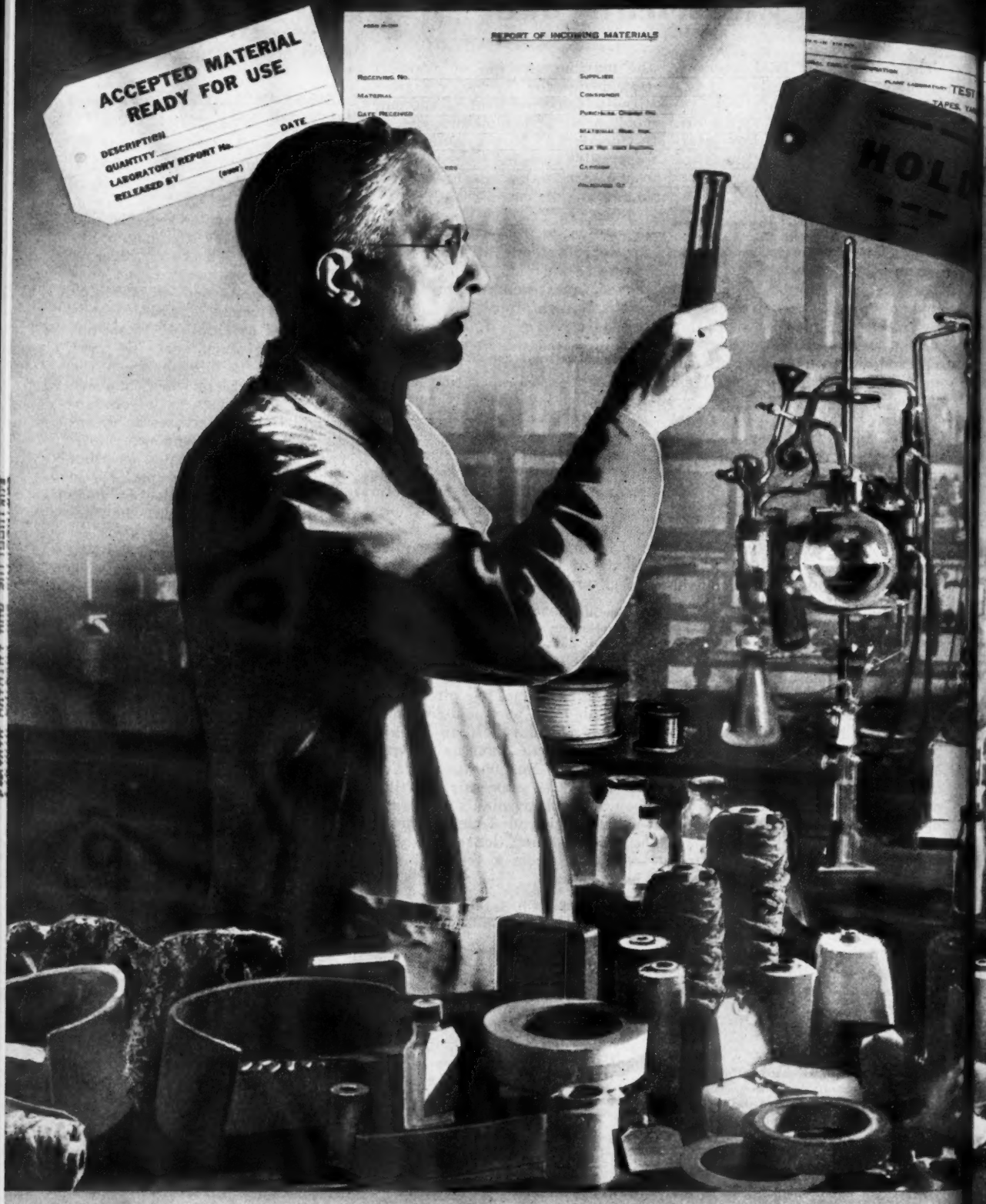
Article 336. Non-metallic Sheathed Cable. Interpretation No. 261. Issued June 12, 1944.

Statement: A frame building is to have an inaccessible attic. The wiring method will be with non-metallic sheathed cable, Article 336.

Question: Is it required that cable be secured at intervals of 4½ feet?

Finding: Yes, the provisions of sections 3363 and 3366 both apply. Fish work or its equivalent is permissible only for wiring in "finished buildings."

QUALITY CONTROL . . . . . BY GENERAL



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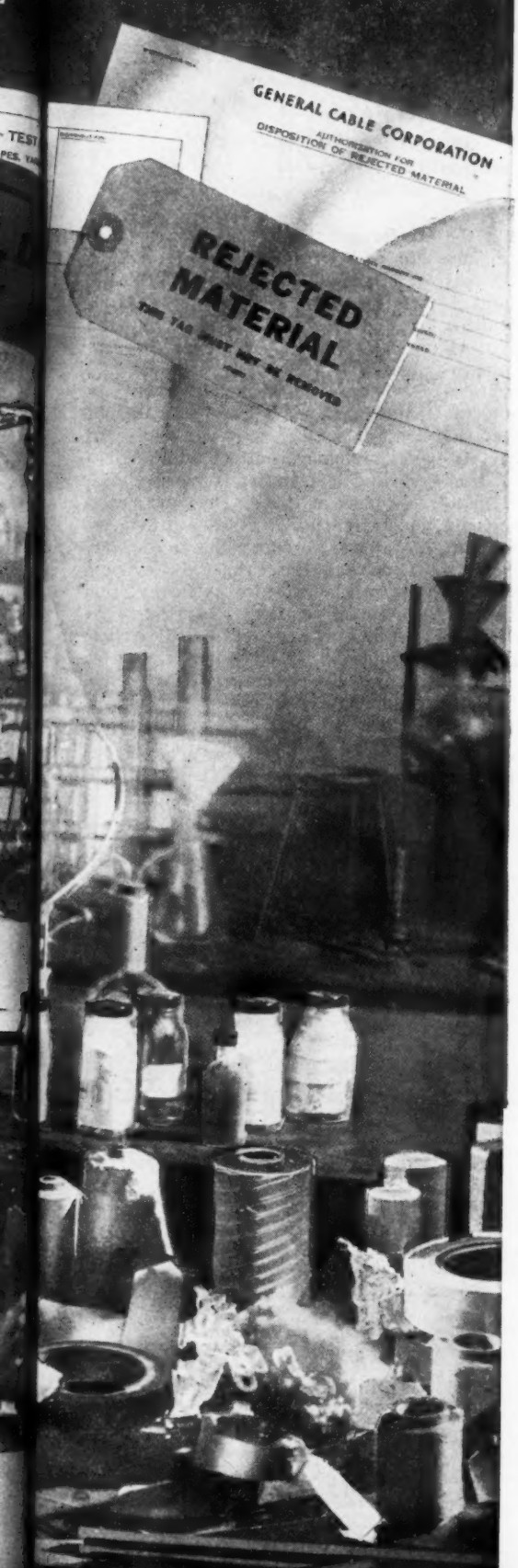

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Simplification Planned for Code

Tentative revision of Articles 210 and 220 of the National Electrical Code, covering Branch Circuits and Feeders, will simplify these important rules.

A RECENT issue of the News Bulletin, of the International Assn. of Electrical Inspectors, outlined plans for a revised edition of the National Electrical Code in 1945, and the various Article Committees are now at work considering proposals submitted to them. Because Articles 210 and 220 have such a wide application in the wiring industry, members will be particularly interested in the results of the activity of these committees to date.

So far, the study has been devoted largely to the changes that appear to be desirable from the several field problems and other conditions arising since the 1940 Code was issued. In 1942, the Article Committee approved a proposal for the consolidation of the separate requirements for the several types of branch circuits. The efforts of the Committee during the past year have been devoted mainly to improving the present Code text and arrangement; the simplification of the detailed requirements and limitations applicable to devices and appliances; and to the coordination of official interpretations and the interim amendments with the current provisions of the Code. In addition, and more recently, considerable study has been given to other changes and additions that may be necessary to care for anticipated postwar demands.

A table containing the principal requirements for the different types of branch circuits has been developed and is included with the consolidated branch circuit provisions. Also, the "unit load" and "demand factor" table for general lighting have been consolidated and located in Article 220, with a cross-reference thereto in article 210. In addition, the "demand factor" Table No. 29 for household electric ranges, has been revised and expanded to include the "maximum demand" table for ranges as authorized by Interim Amendment 74.

The revisions include some technical changes but, as pointed out, reflect mainly a careful editorial re-arrangement directed toward improved clarity and a more logical sequence of items. Below is a complete reprint of these two articles. A cross-reference index to the 1940 Code and the Proposed Revision, is available. In releasing this proposed revision, which has been tentatively approved by the Article Committee, the Committee states they will welcome any constructive comments. Comments should be addressed to H. N. Pye, chairman, Post Office Box 5048, Atlanta 2, Ga.

ARTICLE 210—Branch Circuits

General

2101. Scope. The provisions of this Article shall apply to branch circuits supplying lighting or appliance loads or combinations of such loads. If motors, or motor-operated appliances, are connected to any circuit supplying lighting or other appliance loads, the provisions of this article and Article 430 both shall apply. Article 430 shall apply if branch circuit supplies only motor loads.

2102. Other Article Provisions. The provisions referred to in the following Table shall apply to branch circuits supplying the loads referred to therein:

	Section
Cranes and Hoists	6142
Elevators	6251
Infra-red Industrial Heating Equipment	42—
Instruments	93843
Motors	Article 430
Organs	6506
Outside Festoons	7344
Railway Properties	1110
Signal and Control Systems	8006
Signs and Outline Lighting	6007
Sound Recording and Reproduction	6406
Systems over 600 Volts	7141 to 7144
Systems under 50 Volts	7204
Theatres and Similar Occupancies—	5241, 5286 and 5292

2103. Multi-Wire Branch Circuits. A multi-wire branch circuit as referred to in this article is a circuit consisting of two or more ungrounded conductors having a potential difference between them, and an identified grounded conductor having equal potential difference between it and each ungrounded conductor of the circuit and which is connected to the neutral conductor of the system. Branch circuits recognized in this article may be installed as multi-wire circuits.

If conductors of multi-wire branch circuits and also 2-wire branch circuits connected to the same system are installed in raceways, as open work, or as concealed knob and tube work, it is recommended that they be color coded to facilitate balancing.

2104. Common Neutral. In other than dwelling occupancies, a common grounded neutral conductor may be employed for two or more multi-wire branch circuits, subject to the following provisions:

a. Number of Conductors. Not more than 8 ungrounded conductors shall be used.

b. Carrying Capacity. The neutral conductor shall at any point have a carrying capacity not less than the sum of the ratings of all overcurrent devices protecting the ungrounded conductors of one polarity for which it forms a return circuit.

c. Conductors in Raceways. Where the conductors are in a metal raceway, all conductors of the circuit shall be contained within the same raceway. If installed in conduit or tubing, the size of the raceway shall be in conformity with Table 11, Chapter 10.

2105. Voltage. Branch circuits of any of the types recognized in this article, supplying lampholders, fixtures or receptacles of the standard 15-ampere or less rating, shall not exceed 150 volts to ground, except in industrial establishments that supply only lighting fixtures which are not less than 8 feet from the floor and which do not have switch control as an integral part of the fixture. In dwelling occupancies, the voltage between conductors supplying lampholders of the screw-shell type, receptacles, or appliances, shall not exceed 150 volts, except that the voltage between conductors supplying permanently connected appliances or portable appliances of more than 1,650 watts may exceed 150 volts if connected to receptacles of such design that attachment plugs used on circuits of other voltages cannot be inserted in them.

2106. Heavy-Duty Lampholders. Heavy-duty lampholders as referred to in this article shall include Edison-Base lampholders of the mogul type, and other lampholding devices required for lamps exceeding the maximum rating of the medium-base lamps as provided in Section 94201.

2107. Receptacles. Receptacles connected to circuits of more than 150 volts between conductors shall be of such design that attachment plug caps used on circuits of other voltages cannot be inserted in them.

Plug-in connections, or other devices for supplying appliances or lampholders from busways of 20 amperes capacity or less, shall not be interchangeable with such devices for use on busways of larger capacity, unless overcurrent protection rated at not exceeding 15 amperes is provided as an integral part of the plug-in connection or other attachment device.

2108. Calculation of Load. The load shall be computed in accordance with the following:

a. General Lighting. The floor area shall be computed from the outside dimensions of the building, apartment or area involved, and the number of floors, not including open porches, garages in connection with dwelling occupancies, nor unfinished spaces in basements or attics of dwellings. For general illumination, in occupancies listed in Table of paragraph b. of Section 2202, a load of not less than the "watts per square foot" specified in Column A shall be included for each square foot of floor area.

Where in normal operation the maximum load will continue for long periods of time, the above minimum "watts per square foot" should be increased by 25 per cent, in order to provide that the wiring system shall have sufficient load-carrying capacity to insure efficient and economical operation.

In single-family and multi-family dwellings, all receptacle outlets, except those connected to the special circuits specified in paragraph 2109-a, shall be considered as outlets for general illumination. All receptacle outlets in guest rooms of hotels shall be considered as outlets for general illumination.

Elsewhere than in dwellings and guest rooms of hotels, receptacle outlets shall not be considered as outlets for general illumination. Exception may be made to this provision where lighting equipment is intended to remain in fixed position but is supplied through receptacle outlets to facilitate servicing and replacement.

In other occupancies, a load of not less than 5 amperes for each outlet for heavy-duty lampholders and 1½ amperes for other outlets shall be included.

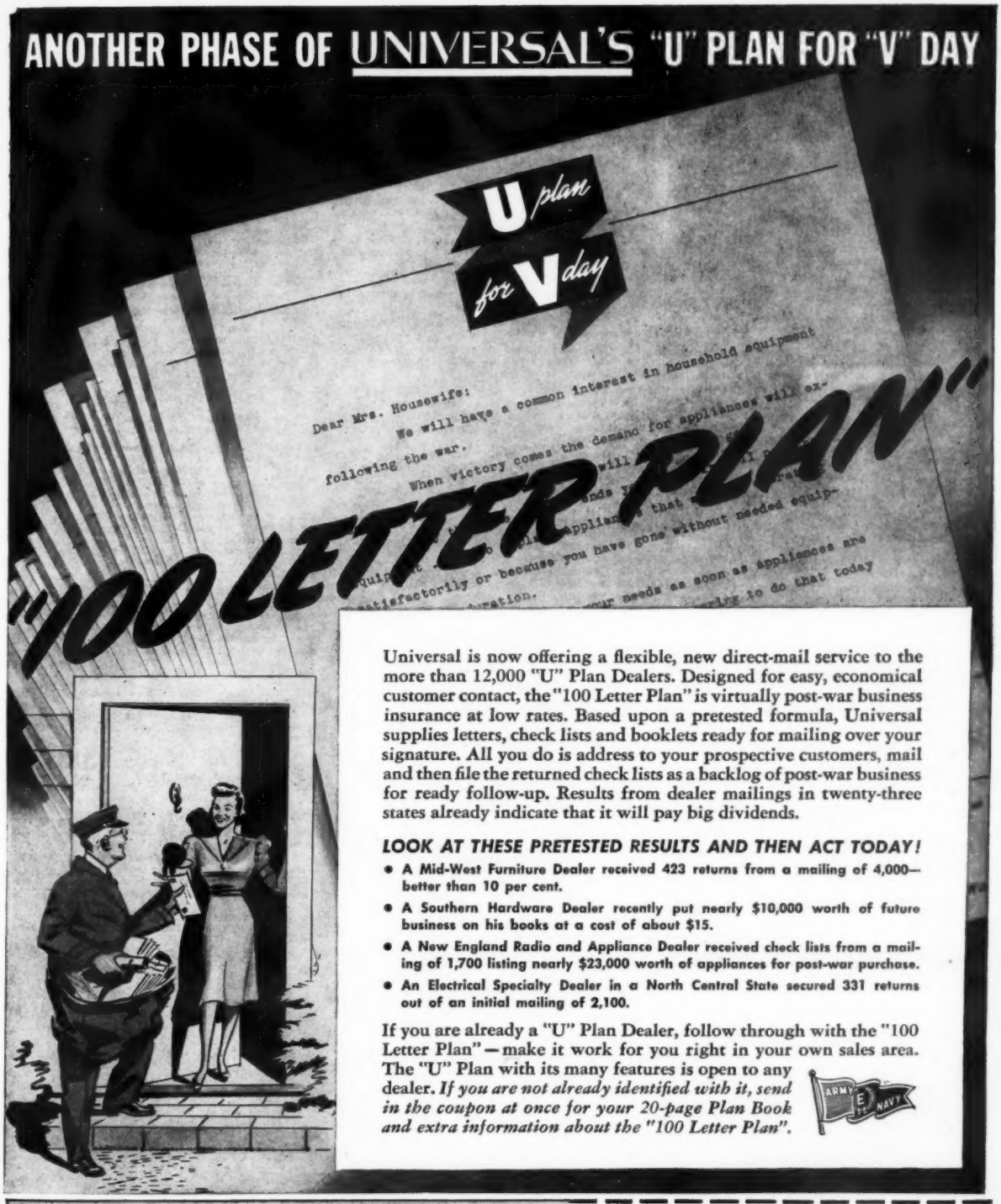
b. Other Loads. For lighting other than general illumination (including show window lighting) and for appliances, a load of not less than specified below shall be included for each outlet:

Outlets For	Load per Outlet
*Specific Appliances	Ampere rating of appliance
Heavy-Duty Lampholders	5 Amperes
†Other Outlets	1½ Amperes

*For household electric ranges individually rated at more than 1,650 watts, the load may be computed in accordance with Table 29, Chapter 10.

†This does not apply to outlets connected to the receptacle circuit specified in paragraph a of Section 2109. For show-window lighting a load of not less than 200 watts may be included for each linear foot of show-window measured horizontally

ANOTHER PHASE OF UNIVERSAL'S "U" PLAN FOR "V" DAY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along its base in lieu of 1½ amperes per outlet.

c. Exceptions. The minimum loads for outlets specified in sub-paragraph b, shall be modified as follows:

1. Multi-Outlet Assemblies. Where fixed multi-outlet assemblies are employed, each five feet or fraction thereof of each separate and continuous length shall be considered as one outlet of not less than 1½-ampere capacity; except in locations where a number of appliances are likely to be used simultaneously when each one foot or fraction thereof shall be considered as an outlet of not less than 1½ amperes.

Busways so designed that loads can be connected at any point shall be limited in length as provided for multi-outlet assemblies; except that under conditions of operation where the load will not exceed that permitted for a branch circuit, the authority enforcing this code may permit busways of greater length.

2. Telephone Exchanges. Shall be waived for manual switchboards and switching frames in telephone exchanges.

d. Existing Installations. Additions to existing installations shall conform to the following:

1. Dwelling Occupancies. New circuits or extensions to existing circuits may be determined in accordance with sub-paragraph a. or b. of this section; except that portions of existing structures not previously wired, or additions to the building structure, either of which exceeds 500 square feet in area, shall be determined in accordance with sub-paragraph a. of this section.

2. Other Than Dwelling Occupancies. When adding new circuits, or extensions to existing circuits, in other than dwelling occupancies, the provisions of sub-paragraphs a. or b. of this section shall apply.

2109. Determination of Circuits. In so far as practical, the total load shall be evenly proportioned among the branch circuits according to their capacity. The number of circuits shall in every case be sufficient for the specific loads to be served; but not less than the number determined from the total load as computed by Section 2108 and the capacity (type) of circuits to be used and, in addition, the following:

a. Receptacle Circuits. In dwelling occupancies, one or more branch circuits shall be provided for all receptacle outlets (other than outlets for clocks), in kitchen, laundry, pantry, dining room and breakfast room, and such circuits shall not have other outlets connected thereto. The conductors of such circuits shall be not smaller than No. 12 and the rating of receptacles connected thereto shall be not less than 15 amperes.

b. Other Circuits. Branch circuits shall be provided for specific loads as required by other articles of the Code.

2110. Receptacle Outlets. Receptacle outlets shall be installed as follows:

a. General. Where portable cords are used, except where the attachment of cords by other means is specifically permitted.

b. Dwelling Type Occupancies. In every kitchen, dining room, breakfast room, living room, parlor, library, den, sun room, recreation room and bedroom, one receptacle outlet shall be provided for every 20 linear feet or major fraction thereof of the total (gross) distance around the room as measured horizontally along the wall at the floor line. The receptacle outlets shall, in so far as practicable, be spaced equal distances apart. At least one receptacle outlet shall be installed for the connection of laundry appliances.

A cord connector that is supported by a permanently connected cord pendant is considered a receptacle outlet. Receptacles in floor outlets shall not be counted as part of the required number of receptacle outlets unless located close to the wall.

See Example No. 1, Chapter 10.

BRANCH CIRCUIT REQUIREMENTS

2121. Classification. Branch circuits shall be classified in accordance with the maximum permitted rating or setting of the overcurrent device. When conductors of larger size than specified are used to provide for voltage drop, the specified rating or setting of the overcurrent device shall determine the circuit classification. The classifications recognized by this article shall be as follows:

a. Individual Branch Circuits. Branch circuits having a single outlet connected thereto shall be designated as "Individual Branch Circuits" and shall be of sufficient capacity for the load to be served.

b. Multi-Outlet Branch Circuits. Branch circuits having two or more outlets connected thereto shall be designated as "Multi-Outlet Branch Circuits" and shall be of the following ratings: 15 ampere, 20 ampere, 25 ampere, 35 ampere and 50 ampere.

2122. Conductors. Circuit conductors shall conform to the following:

a. Carrying Capacity. Shall have a carrying capacity not less than the rating of branch circuit and not less than maximum load to be served.

b. Minimum Size. Shall be not smaller than No. 14.

c. Exceptions:

1. Demand Factors. Applicable demand factors may be applied to the provisions of paragraph a. above. Where the maximum demand of a range is computed according to Method A of Table 29, Chapter 10, the neutral conductor of a three-wire branch circuit supplying domestic electric ranges may be smaller than the ungrounded conductors but shall have a carrying capacity at least 70 per cent of the current-carrying capacity of the ungrounded conductors.

2. Taps and Loops. Taps to individual lampholders or fixtures; taps not over 18 inches long to individual outlets; and loops not over 25 feet (maximum length of conductor 50 feet) to single pole switches may be of less capacity than the branch circuit rating; but not less than the load to be served, and not smaller than No. 12 for 50-ampere circuits, and No. 14 for other circuits.

3. Outlet Devices. Outlet devices may have less carrying capacity than the branch circuit rating but shall conform to Section 2124.

4. Fixture Wires and Cords. Fixture wires and cords may be of smaller size if in accordance with provisions of paragraph b. of Section 2403.

2123. Overcurrent Protection. The rating or setting of overcurrent devices shall conform to the following:

a. Rating. Shall be not in excess of the carrying capacity of the circuit conductor.

b. Single Appliance. Shall not exceed 150% of the rating of the appliance, if the circuit supplies a single appliance only.

c. Exceptions:

1. Taps and Fixture Wires. Taps, switch loops, fixture wires and cords as permitted in paragraph c. of Section 2122 may be considered as protected by the circuit overcurrent device.

2. Ranges. Circuit conductors supplying a single household electric range only may be considered as protected by overcurrent devices having a rating or setting not over 125 per cent of their carrying capacity.

2124. Outlet Devices. Lampholders and receptacles shall conform to the following:

a. Rating. Shall have a rating of not less than the load served.

b. Limitations. Shall conform to the limitations specified in Table of Section 2127.

c. Exceptions:

1. Demand Factors. Applicable demand factors may be applied.

2. Lampholders. Medium base lampholders of the porcelain keyless type and lampholders for fluorescent lamps may be connected to 20-ampere branch circuits, if only fixed lighting units are supplied.

Fixed lighting units are those that are intended to remain in fixed positions and are connected directly to the permanent wiring, except that receptacles may be permitted as a connecting means for such units in order to facilitate servicing and replacement.

3. Receptacles. Receptacles rated at 15 amperes may be connected to 20-ampere receptacle circuits conforming to the provisions of paragraph a. of Section 2109.

2125. Maximum Load. The maximum load shall conform to the following:

a. Motor-Operated Appliances. The total load shall not exceed 80% of the circuit capacity, if motor-operated appliances are supplied. (Note—If circuit supplies only motor-operated appliance loads, Article 430 is to apply.)

b. Other Loads. The total load shall not exceed the capacity of branch circuit.

c. Exceptions:

1. Demand Factors. Applicable demand factors may be applied.

2126. Permissible Load. Individual branch circuits may supply any load. Multi-outlet branch circuits may supply only loads as follows:

a. 15, 20 and 25-Ampere Branch Circuits. Lighting units and/or appliances. Fixed appliances shall be limited to a total rating of not over 6 amperes, if lighting units or portable appliances also supplied.

Every motor supplied by 15-ampere or 20-ampere branch circuit at over 125 volts, and every motor supplied by a 25-ampere branch circuit, must have running overcurrent protection. (See paragraph b. of Section 4322.)

Every motor of higher rating than 1-horsepower or 6-ampere supplied by a 15-ampere, 20-ampere, or 25-ampere branch circuit must be provided with a running overcurrent protective device and controller that are approved for group operation. (See paragraph b. of Section 4332.)

b. 35-Ampere Branch Circuit. Lighting units in other than dwelling occupancies; or fixed appliances, other than motor-operated.

c. 50-Ampere Branch Circuit. Lighting units in other than dwelling occupancies; or fixed cooking appliances; or fixed range and water heater.

2127. Table of Requirements. The devices connected to branch circuits recognized in this Article shall be in accordance with the following Table:

	TYPE OF BRANCH CIRCUIT				
	15-Amp.	20-Amp.	25-Amp.	35-Amp.	50-Amp.
CONDUCTORS: TYPE R*—					
(Min. Size, Gage No.) Circuit Conductors**	14***	12	10	8	6
Taps and Switch Loops	14***	14	14	14	12
MAXIMUM OVERCURRENT PROTECTION	15-Amp.	20-Amp.	25-Amp.	35-Amp.	50-Amp.
OUTLET DEVICES:					
Lampholders Permitted	Any Type	Heavy Duty *1	Heavy Duty	Heavy Duty	Heavy Duty
Receptacles (Minimum rating)	*2	20-Amp.*3	20-Amp.	25-Amp.	35-Amp.
MAXIMUM LOAD	15-Amp.	20-Amp.	25-Amp.	35-Amp.	50-Amp.
PERMISSIBLE LOAD	Section 2126a.	Section 2126a.	Section 2126a.	Section 2126b.	Section 2126c.

(*) **Other Type Conductors**—For size, see Tables 1 and 2, Chapter 10.

(**) **Fixture Wires and Cords**—See Section 2122-c-3.

(***) **Conductors**—See Section 2109a.

(*1) **Lampholders**—See Section 2124-c-2.

(*2) **Receptacles**—Not over 15 amperes for 15-ampere circuits and 15 amperes for Receptacle Circuits of 2109a.

(*3) **Receptacles**—See Section 2124-c-3.

Recommendation to Article 422 Committee:

As the second sentence of present code Section 2174 is primarily a construction requirement for appliances, Article 210 Committee recommends the transfer of this provision to Article 422.

ARTICLE 220—FEEDERS.

Note—Rearrangement of Sections in following sequence is proposed: 2204-03-01-02-05.

2201. Feeder Size. Feeder conductors shall not be smaller than specified in Tables 1 and 2 of Chapter 10 for the computed feeder load as determined by Section 2203. A 2-wire feeder supplying two or more 2-wire branch circuits, or a 3-wire feeder supplying in excess of two 2-wire branch circuits, or two or more 3-wire branch circuits, shall be not smaller than No. 10. If a feeder carries the total current supplied by the service-entrance conductors, such feeder shall, for services of No. 8 and smaller, be of the same size as the service-entrance conductors.

See Examples Nos. 1, 2, 3, and 4 of Chapter 10.

2202. Voltage Drop. The size of the feeder conductors should be such that voltage drop up to the final distribution point for the load as computed by Section 2203 will not be more than 3 per cent for power loads, and not more than 1 per cent for lighting loads or combined lighting and power loads.

2203. Computation of Feeder Loads. The computed load of a feeder shall be the sum of the computed loads as determined for branch circuits in accordance with Section 2108, subject to the following provisions:

a. Small Appliances. For small appliances, a load of not less than 1,500 watts shall be included for dining room, kitchen and laundry purposes in single-family dwellings, for individual apartments of multi-family dwellings having provisions for cooking by tenants, and in each hotel suite having a serving pantry. If the load is subdivided through two or more feeders, the computed load for each shall include not less than 1,500 watts for small appliances. (See Sub-paragraph b.)

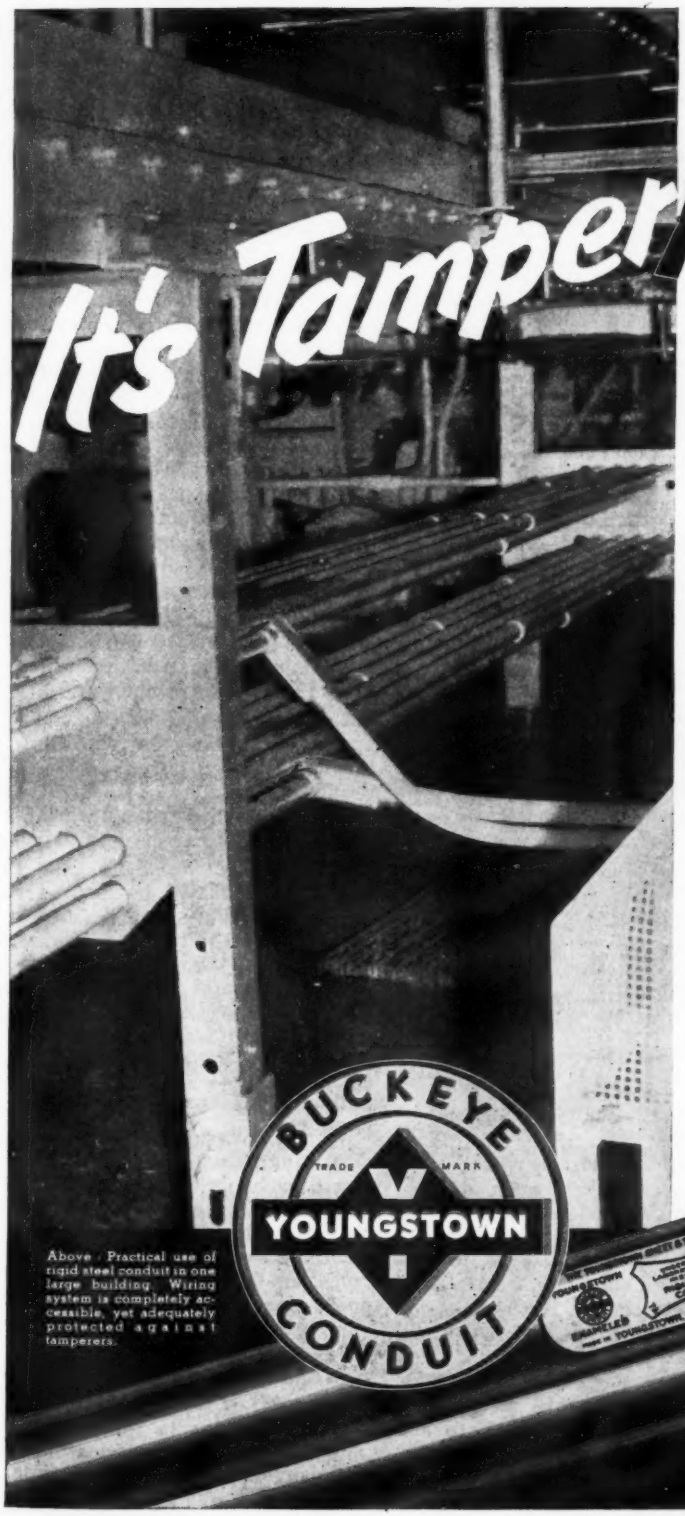
b. Demand Factors (General Lighting and Small Appliances). The demand factors specified in the following Table for the occupancies listed may be applied to the computed loads for general illumination as determined by Section 2108 and the small appliance loads specified in sub-paragraph a. of this Section.

UNIT LOAD AND FEEDER DEMAND FACTOR TABLE.

TYPE OF OCCUPANCY	COLUMN A Watts Per Sq. Ft. Sec. 2108a	COLUMN B Demand Factor Wattage—based on area served	Per Cent
Armories and Auditoriums	1	Total Wattage	100
Banks	2	Total Wattage	100
Barber Shops and Beauty Parlors	3	Total Wattage	100
Churches	1	Total Wattage	100
Clubs	2*	Total Wattage	100
Court Rooms	2	Total Wattage	100
Dwellings—Single-Family	2*†	2,500 or less Over 2,500	100 30
Dwellings—Multi-Family (other than Hotels)	2*	3,000 or less Next 117,000 Over 120,000	100 35 25
Garages—Commercial (storage)	½	Total Wattage	100
Hospitals	2	50,000 or less Over 50,000	40‡ 20
Hotels, including apartment houses without provisions for cooking	2*	20,000 or less Next 80,000 Over 100,000	50‡ 40 30
Industrial, Commercial (Loft) Buildings	1	Total Wattage	100
Lodge Rooms	1½	Total Wattage	100
Office Buildings	2	20,000 or less Over 20,000	100 70
Restaurants	2	Total Wattage	100
Schools	3	15,000 or less Over 15,000	100 50
Stores	3	Total Wattage	100
Warehouses, Storage	¼	12,500 or less Over 12,500	100 50
Other Occupancies	Sec. 2108b	Total Wattage	100

In any of the above occupancies, except "Single-Family Dwellings" and individual apartments of "Multi-Family Dwellings," the "watts per square foot" specified below may be applied to areas used for the following purposes:

For SAFETY'S sake . . . use CONDUIT
(Full Weight Rigid Steel)



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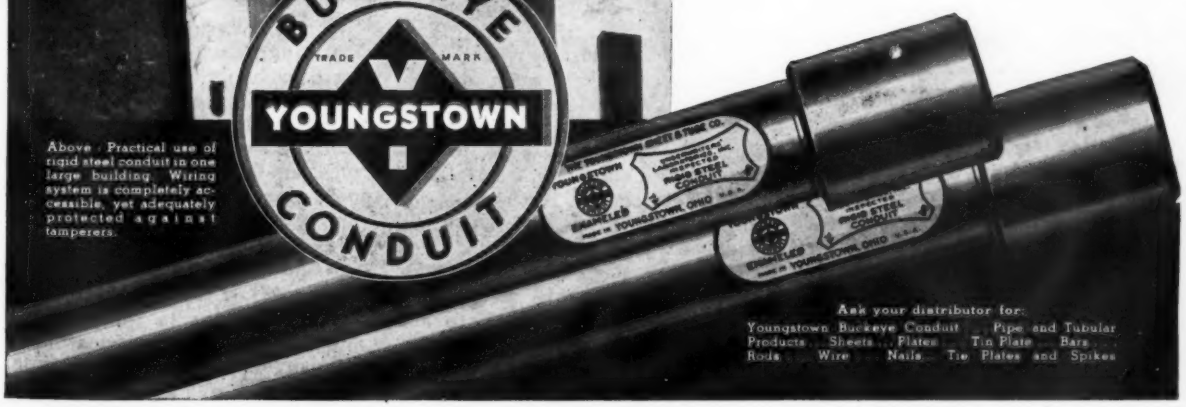

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	Watts per sq. ft.
Assembly Halls and Auditoriums	1
Hallways, Corridors and Closets	½
Storage Spaces	¼

*It is recommended that in occupancies used for dwelling purposes, in addition to any branch circuit supplying appliances, a 15-ampere branch circuit be installed for each 500 square feet (approximately 3 watts per square foot) of floor area.

†In a single-family dwelling with a floor area of 500 square feet or less, the lighting load may be determined as specified in sub-paragraph b. of this section.

‡For sub-feeders to areas where entire lighting is likely to be used at one time, as in ballrooms, dining rooms, operating rooms, etc., a demand factor of 100 per cent shall be used.

1. The unit values and the demand factors of the table, are based on minimum load conditions and may not provide sufficient feeder capacity for the installation contemplated. If at any time it is found that feeder conductors will be, or are, overloaded, they shall be increased to comply with the provisions of Tables 1 and 2 of Chapter 10.

In view of the trend toward higher intensity lighting systems and indirect lighting, and increased loads due to more general use of fixed and portable appliances, each installation should be considered as to the load likely to be imposed, and feeder capacity increased to permit of efficient and economical operation without expensive alterations and replacements in the system.

c. **Household Electric Ranges.** For household electric ranges and other household cooking appliances that are individually rated at more than 1,650 watts, a load of not less than that computed according to Table 29, Chapter 29, shall be included.

Where a number of ranges is supplied by a multiphase feeder, the current shall be computed on the basis of the demand of twice the maximum number of ranges connected between any two-phase wires.

See Example No.———.

d. **Motor Load.** The load for motors shall be computed according to the provisions of Sections 4314 and 4316.

e. **Show-Window Lighting.** For show-window lighting a load of not less than 200 watts shall be included for each lineal foot of show-window measured horizontally along its base. See 2108b.

f. **Neutral Feeder Load.** The neutral feeder load shall be the maximum unbalance of the load determined by Section 2203.

The maximum unbalanced load shall be the computed load obtained by Section 2203 less all loads tapped from the ungrounded feeders and not connected to the neutral; except that the load thus obtained shall be multiplied by 140 per cent for 5-wire two-phase systems. For a feeder supplying domestic electric ranges, the maximum unbalanced load shall be considered as 70 per cent of the load on the ungrounded conductors, computed by Method A of Table 29, Chapter 10.

For 3-wire D. C. or single-phase A. C., 4-wire three-phase and 5-wire two-phase, a further demand-factor of 70 per cent may be applied to that portion of the unbalanced load in excess of 200 amperes.

See Examples 1, 2, 3 and 4, Chapter 10.

2204. Common Neutral Feeder. A common neutral feeder may be employed for two or three sets of 3-wire feeders, or two sets of 4-wire or 5-wire feeders. When in metal enclosures, all conductors of feeder circuits employing a common neutral feeder shall be contained within the same enclosure as provided in Section 3052.

2205. Diagram of Feeders. If required by the authority enforcing this code, a diagram showing feeder details shall be supplied previous to installation. This diagram should show: Area in square feet; load (before applying demand-factors); demand-factors selected; computed load (after applying demand-factors); and the size of conductors.

CHAPTER 10.

TABLE 29—COMPUTATION OF LOAD FOR HOUSEHOLD ELECTRIC RANGES.

Loads for one or more cooking appliances may be computed in accordance with Methods A or B.

Method A is recommended for small ranges (less than 8,750 watts) to provide reasonably adequate wiring capacity for possible future changes.

METHOD A.

The load for all ranges individually rated more than 1,650 watts and not more than 12 KW may be calculated on the basis of:

Number of Ranges	Maximum Demand
1	7 KW
2	11 KW
3	14 KW
4	17 KW
5	20 KW
6-40	15 KW plus 1 KW for each range.
41 and Over	25 KW plus ¾ KW for each range.

For ranges having ratings in excess of 12 KW, but not to exceed 21 KW, five per cent (5%) shall be added to above values for each additional KW of rating or major portion thereof by which the individual range rating exceeds 12 KW. Ranges over 21 KW are not considered as household electric ranges and demand should be determined on the basis of rating and use. Generally the demand for commercial ranges will be based on the maximum nameplate rating.

METHOD B.

The load for all ranges individually rated more than 1,650 watts and not more than 8,750 watts may be calculated on the basis of the demand factors given below applied to the sum of the nameplate ratings of all ranges used:

DEMAND FACTORS FOR RANGES RATED 1,650 WATTS AND UNDER 8,750 WATTS.

Number of Ranges	Demand Factor (Per Cent.)	Number of Ranges	Demand Factor (Per Cent.)
1	80	14	41
2	75	15	40
3	70	16	39
4	66	17	38
5	62	18	37
6	59	19	36
7	56	20	35
8	53	21	34
9	51	22	33
10	49	23	32
11	47	24	31
12	45	25 and Over	30
13	43		

NEW EXAMPLE.

RANGES ON A 3-PHASE SYSTEM.
(Section 2203c.)

Thirty ranges rated at 12 KW each are supplied by a 3-phase, 4-wire, 120/208-volt feeder, 10 ranges on each phase.

As there are 20 ranges connected to each ungrounded conductor, the load should be calculated on the basis of 20 ranges (or in case of unbalance, twice the maximum number between any two-phase wires) since diversity applies only to the number of ranges connected to adjacent phases and not the total.

The current in any one conductor will be one-half the total watt load of two adjacent phases divided by the line to neutral voltage. In this case, 20 ranges (from Table 29) will have total watt load of 35,000 watts for two phases; therefore, the current in the feeder conductor would be:

$$17{,}500 \div 120 = 146 \text{ amperes}$$

On a three-phase basis the load would be:

$$3 \times 17{,}500 = 52{,}500 \text{ watts}$$

and the current in each feeder conductor—

$$\frac{52{,}500}{208 \times 1.73} = 146 \text{ amperes.}$$

Code Change Proposal Schedule Announced

Recent announcement of plans of the Electrical Committee, of the National Fire Protection Association, to issue a 1945 edition of the National Electrical Code, has been followed by the following schedule of dates governing submission of proposals for changes:

1. Proposals for change in the 1940 Edition of National Electrical Code originating outside the various sub-committees of the Electrical Committee must be submitted not later than September 30, 1944.

2. Such proposals will be referred by the chairman of the Electrical Committee to the various sub-committees for preparation of recommendations to the Electrical Committee.

3. These reports of the subcommittees are to be published on or about February 1, 1945.

4. It is expected that the Electrical Committee will meet about the middle of May, 1945, to act upon the published recommendations of the sub-committees, and will adopt a revised text for the National Electrical Code.

5. The foregoing program is subject to modification if war conditions require it.

Electronics Exhibition Scheduled for 1945

An International Electronics Exposition — designed to show American industry what electronics will do — has been scheduled for the latter part of 1945 if general conditions permit, according to an announcement released by the Electronics Section of the National Electrical Manufacturers Association. This group and all other NEMA sections having a direct interest in electronic devices will sponsor the exposition.

While the time and place for the show will be announced later, it is pointed out that exhibitors will not be restricted to manufacturers who are members of NEMA. The exposition will be open to all manufacturers of electronic equipment and components.

In accordance with the present plans of the sponsors:

1. Exhibits will be restricted as much as possible to working exhibits or demonstrations which utilize electronic principles.

2. There will also be an exhibit sponsored directly by the Electronics Section composed of graphs, charts, etc., showing the uses of electronic principles in industry and other non-mass entertainment fields.

3. Provision will be made for technical sessions or clinics under the sponsorship of technical groups in the industry on the subject of electronic principles.

4. It is expected that this will be the first of a series of annual expositions to be established as the outstanding event of the year in the electronics industry.

When the Permanent Exposition Operating Committee is appointed it will probably include among its members representatives of other NEMA sections having a direct interest—such as industrial control, panelboard and distribution board, large generating and converting apparatus, switchgear and X-ray—and possibly from one or two others.

Some other sections will also have an interest in the sponsorship of the exposition because of the use of electronic devices in their industries.

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Billions of feet of "U. S." wires and cables have been shipped to our fighting fronts . . . wires and cables badly needed by you here at home . . . but indispensable to our Armed Forces.

Much of that huge output was Laytex Wires and Cables, in heavy demand on the domestic front. But you understood . . . you did not question the right of our Army and Navy to every foot of it.

It was natural that Laytex should be required for many military services — communication, signaling, data transmission, searchlight and gun control. For Laytex is an unusual wire development. It is lighter and more

flexible than any other wire of the same capacity. It is especially valuable for military uses in swamps, deserts, rough terrain — even under-water services.

The men and women of the Bristol, R. I. plant of the U. S. Rubber Company, makers of Laytex Wires and Cables, have been given the Army-Navy "E" for a job well done. In expressing appreciation to them we are not unmindful of the share you, our customers, have had in this effort . . . you who have so willingly set aside plans and made the best of it, until Laytex is again available. In the final analysis, you wouldn't have wanted it any other way.

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How to Apply Electronics To In dustrial Problems

ALTLHOUGH many of the applications of electronics to industrial control problems require special engineering and equipment of special design, it is surprising how many control problems can be solved by simply applying a standard electronic relay which is available from the manufacturers in a self-contained case ready for installation.

Typical applications for such a device are stop switches in textile mills, liquid level controls, detection of water in gasoline tanks, contact-making instruments, counters and pressureless limit switches, sorting small parts, maintaining constant temperature baths, signaling, testing materials, detecting seams in cloth for textile mills, testing the conductivity of solutions, and many other applications.

The electronic type relay can be installed with particular advantage in applications where the actuating contacts do not provide a suitable low resistance path for operating a magnetic relay — due to corrosion, lint, low conductance value of the elements in the circuit, etc.—or the contact made does not last long enough to permit the relay to operate.

Whenever a magnetic type relay is energized, the resistance between the coil energizing contacts must be low in order to permit the relatively large amount of current to flow, and this contact must be made for a length of time sufficient for the relay to function or else the relay operation may be erratic and inconsistent. In some cases it is objectionable to have voltages from a low impedance circuit appear across the actuating contacts as this might cause pitting and sticking of these contacts due to arcing.

The electronic relay can be used where a magnetic type of relay would not be satisfactory. These relays are designed to permit operation even when the actuating contacts which operate the relay introduce a resistance value up to 5,000,000 ohms in the circuit. The relay will operate even though the actuating contacts make contact for only .004 second. The small current involved permits the actuating contacts to operate without pitting, arcing or sticking.

In operation, the electronic relay is basically an electronic tube amplifier which has an input and an output circuit. The actuating contacts, such as are used on contact-making instruments, are connected to the input circuit. An electromagnetic relay is connected in the output circuit of the electronic tube. This electromagnetic relay is used to operate the equipment which might be an auxiliary relay, a solenoid valve, or an indicating light. Generally, the electronic relay is so connected that the electromagnetic relay remains energized as long as the actuating contacts remain open.

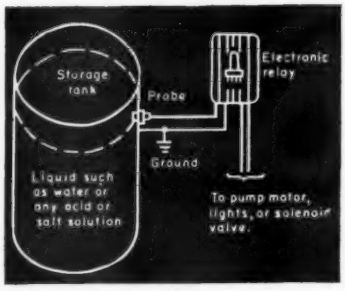


Fig. 2. In this diagram, the electronic relay is connected as a floatless level indicator on a storage tank.

When a body which has the resistance between 0 and 500,000 ohms is connected between the actuating contacts or across the input circuit of the electronic relay, a minute current, which must be measured in microamperes, passes through the actuating circuit. This minute current applied to the electronic tube interrupts the current which keeps the magnetic relay normally energized. The elements or actuating contacts introduced between the terminals of the input circuit will operate the electronic relay successfully even when the wires connecting these contacts are as long as 500 feet. Shielded wiring is not required between the actuating contacts and the input circuit of the relay.

The electronic relay is designed to prevent rapid successive operations of the electromagnetic relay as a result of chattering or intermittent operation of the actuating contacts. This is accomplished by a time delay feature of the electromagnetic relay which prevents it from becoming energized for approximately one-half second after the input circuit or actuating contacts are opened.

One of the applications of the electronic relay is in textile mills

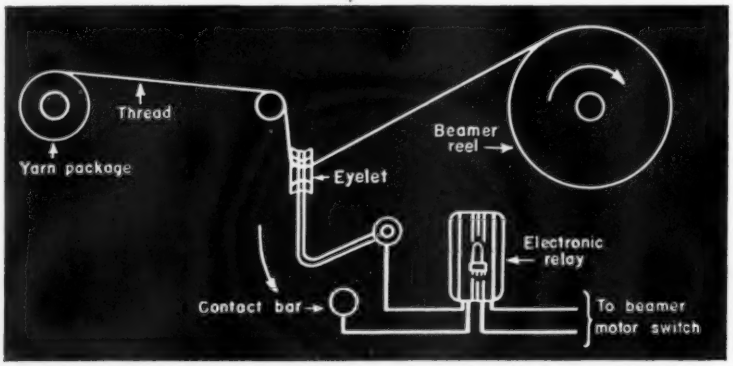
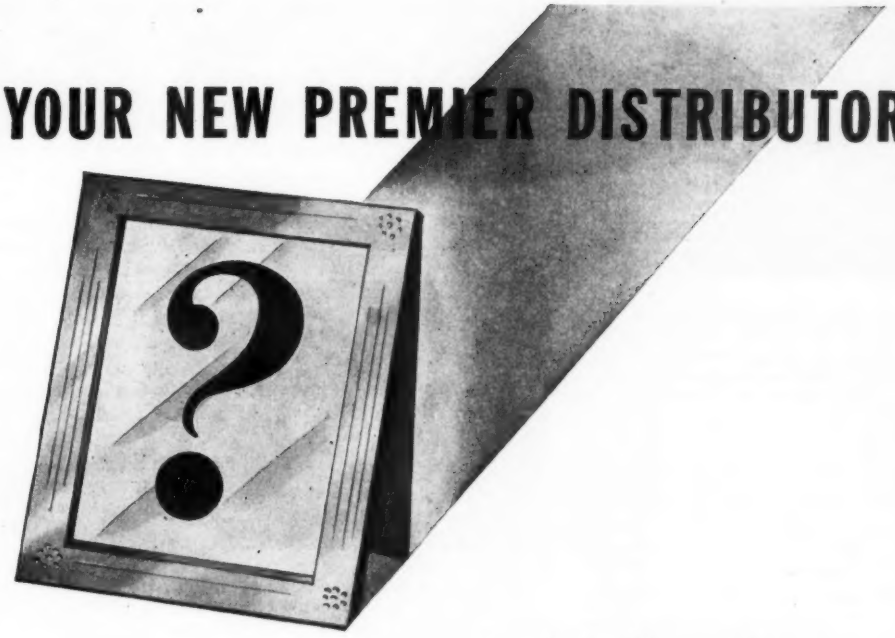


Fig. 1. The "stop-motion" switch on a thread operates the electronic relay to stop beamer-reeling equipment. (Photos and drawings in this article reproduced through courtesy of General Electric Co.)

WHO'S YOUR NEW PREMIER DISTRIBUTOR?



. . . and Why?

● He may have any of eighty different names—depending on just where you're doing business—but the following thumbnail description will fit him. *He's a successful independent specialty appliance distributor—he's located conveniently near you—and he has both the intention and the ability to offer you maximum service.*

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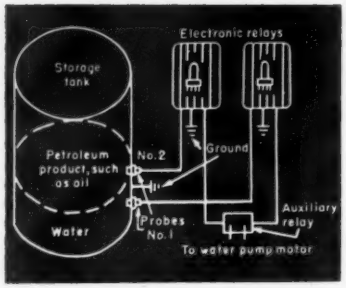

Fig. 3. Two electronic relays connected to a gasoline storage tank are used, as shown here, to stop and start a pump to remove water which collects at bottom.

where it operates in conjunction with the "stop motion" mechanisms of a beamer-reeling equipment. One form of an electronic relay is shown connected to the beamer-reeling equipment in Fig. 1. Just before the threads come to this beamer, each thread passes through a hinged eyelet. A great number of these hinged eyelets are mounted on a rack and are known as thread-stop switches. When the thread breaks it is no longer in tension and the unsupported weight of the stop switch drops on its hinge until it hits a metal bar. The contact which is made closes the input circuit of the electronic relay and stops the entire beamer equipment.

Before the electronic relay was installed, difficulty was encountered in using a standard magnetic relay which was operated directly by thread-stop switches. The difficulty resulted primarily from the thread ends and the thread dust which foul the contact in the presence of moisture. Because the electronic relay can operate reliably and safely on high-resistance circuits, it has proved most satisfactory.

As illustrated in Fig. 2, the electronic relay can be used to give liquid-level indication without resorting to a mechanical

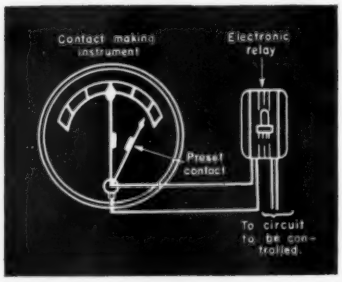

Fig. 4. This circuit shows how the electronic relay is connected for use with a contact-making indicating instrument to control an external circuit.

float. A contact of the input circuit is inserted in the tank at the level at which the liquid is to give an indication. The liquid which is used to operate the electronic relay as furnished must be of such a nature that it will offer not more than 500,000-ohms resistance between the input contacts. Liquids such as water, milk, sodium chloride, acids, and salt solution will operate the relay.

In this application, if the liquid is pumped into the tank, it will upon reaching the input contact operate the electronic relay, which in turn, will stop the pump. In this manner, liquid-level control is obtained.

Two electronic relays are used in pumping out a specific amount of water which collects in the bottom of gasoline storage tanks (Fig. 3). In this case, the gasoline or other petroleum products will not operate the relay. However, water—even when distilled—will operate the relay. When the water reaches contact No. 2, the pump motor operates and pumps the water until its level is below contact No. 1.

Small delicate contacts are

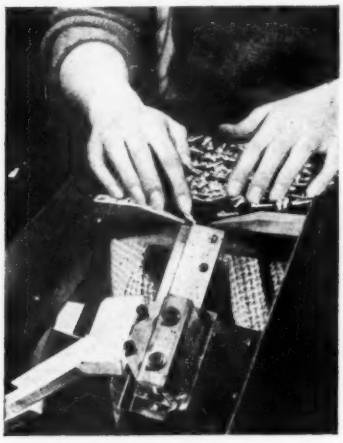

Fig. 6. An electronic relay is applied to this sorting head so as to automatically group small assemblies according to size.

sometimes incorporated in ammeters, voltmeters, or wattmeters (Fig. 4). In such contact-making instruments, the delicate contacts, by means of the electronic relay, can be used to control devices which require contact ratings greater than those for which the instruments are rated. The contacts correspond to some reading on the meter scale, and can be positioned to the required values of current, voltage, or wattage. When the meter needle reaches the value desired, the contacts are closed and operate an electronic relay, which, in turn, operates other required load devices.

The electronic relay is also used to eliminate the welding of the delicate contacts due to arcing. There are many applications for which the contact-making instruments and the electronic relays can be used.

(*Continued on page 58*)

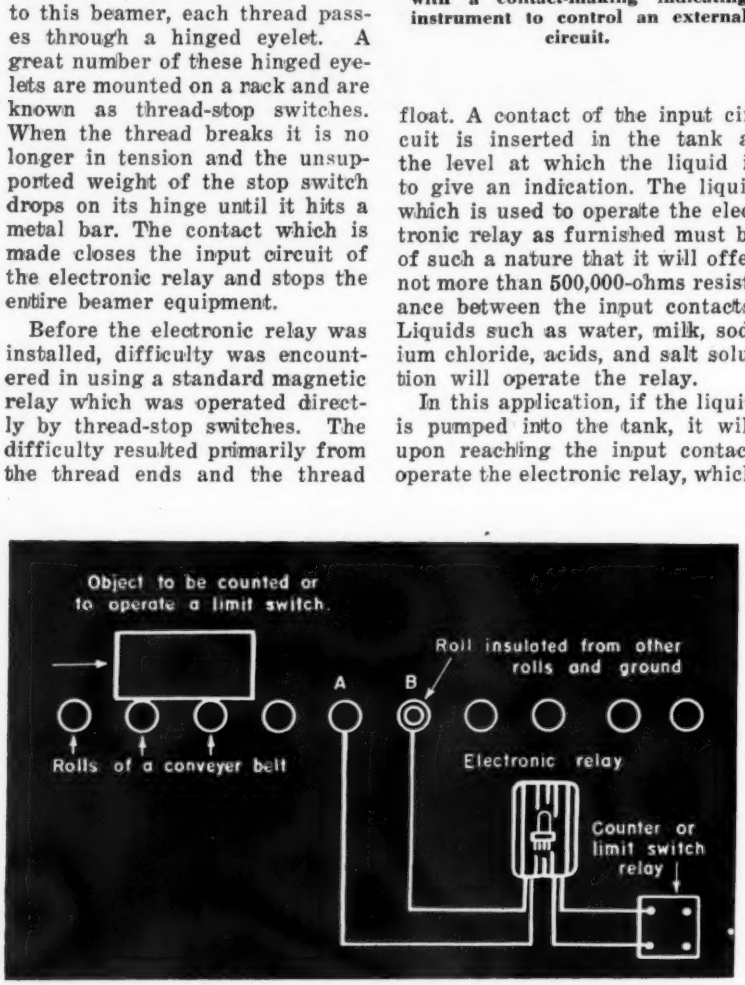
Object to be counted or to operate a limit switch.
Roll insulated from other rolls and ground
A
B
Rolls of a conveyer belt
Electronic relay
Counter or limit switch relay

Fig. 5. Application of electronic relay for operation of a counter or as a pressureless limit switch.

1000 B.C.

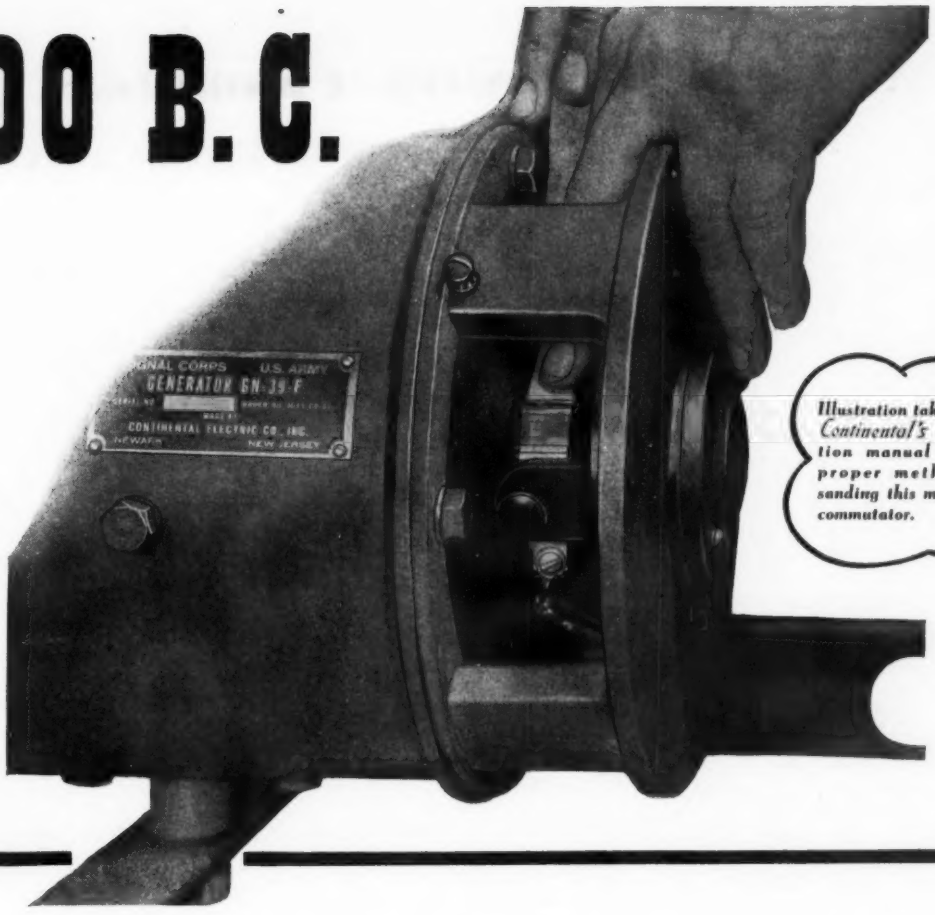

Illustration taken from Continental's instruction manual shows proper method of sanding this multi-bar commutator.

1000 Volts **B**etween **C**oils is the operating voltage of these engine driven generators being built for the Signal Corps by *Continental Electric Co., Inc.* of Newark, N. J.

They are tested at 3000 volts—three times their normal voltage. Yet compact design allows only minimum clearance between coils!

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8-NVP-5

How to Select Capacitors For Capacitor-Start Motors

By A. C. Roe

AMONG THE many types of single phase motors used on all types of appliances and electrical tools, etc., there is one type that uses a capacitor in the starting circuit. This article will define the simpler types of single phase motors and include data on how to check and figure the proper rating of the capacitor to be used for starting only. The main types of motors will be discussed first and the main points covered.

The split phase motor is the common and simplest type of single phase motor, with two windings, starting and running, and a centrifugal switch to open the starting winding at approximately 70% to 80% of full load speed.

In this motor, the two windings are arranged like those of a two-phase motor except that the starting winding has a higher resistance in order to be self starting and to have sufficient starting torque to pick up the load. In this motor, the higher resistance of the starting winding causes phase displacement of the current. Thus starting windings generally have many turns of small wire and are commonly placed over the running windings or near the air gap.

The resistance of the starting winding is generally proportioned to limit the starting current to 4 to 6 times the current input at full load.

The ratio of turns between the main and starting windings varies with different makes and design. The article published in ELECTRICAL SOUTH for July, 1942, gave ten examples of split phase windings and other useful data.

Thus in a split phase motor, the starting torque is dependent upon (a) the number of turns in the starting winding, (b) resistance of the starting winding, (c) the displacement of the current between the main and starting windings, (d) the current in the main winding times the current in the running winding. The phase displacement in the average split phase motor is approximately 20 to 30 degrees.

The capacitor start, single phase motor is similar to the split phase motor in that there are two windings, main and running, a starting switch, and a capacitor in series with the starting winding. The capacitor changes the general characteristics of the single phase motor, and introduces some items that the repairman must consider carefully when rewinding or servicing such motors.

High Starting Torque

The capacitor start motor develops higher starting torque for the same line current than the split phase type. For one reason, the phase displacement is around 70 to 83 degrees, and the starting torque may run 2½ times that of the split phase motor. In the capacitor start motor, the line current is less than the sum of starting and running windings, due to the greater angle of phase displacement, thus more current can be used in either the run or starting winding, or in both, to produce greater starting torque.

The capacitor in most cases offsets the reactance of the starting winding, permitting more turns to be used. Thus, in general, it will be found that the starting windings of the capacitor start motors will have more turns than the main or running winding but will be of smaller size wire.

The foregoing data was presented to indicate the important differences that a capacitor makes when placed in series with the starting winding for starting purposes only.

The switch used to open the starting winding holds the circuits closed until the required torque is developed. In the case of an ordinary split phase motor, a faulty switch failing to open at the proper speed would cause the motor to heat up and would probably burn out the starting winding.

In the case of the capacitor start motor also, the switch must be positive in action, that is, open at the proper speed and stay open. If the springs do not function properly, and permit the switch to flutter, the capacitor will be ruined. The reason for this is as follows: The capacitor volts increase quickly at speeds above that where the switch should open, and if the switch flutters, it is possible to have the voltage doubled. If the fluttering switch leaves the capacitor fully charged and then closes at an instant when voltage of opposite polarity is impressed, the effect on the capacitor will be the same as if double voltage had been impressed upon it. Thus the repairman should pay particular attention to the proper functioning of the switch.

Most capacitor start single phase motors use the modern dry

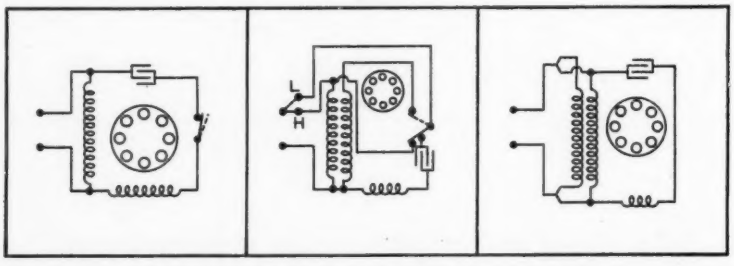

Fig. 1. These typical circuits show capacitor-type single-phase motors. At left is the diagram of a typical capacitor-start, induction-run motor with which this article is concerned. See Fig. 2 for vector diagram of currents. At center, is a two-speed capacitor-start motor having two windings. At right is a motor of the permanent split-phase type with capacitor always connected in the circuit.

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IN CANADA: Canadian Line Materials, Limited, Toronto 13

type of a-c electrolytic capacitor. The internal construction varies but in general two surfaces must be insulated from each other so that the voltage and temperature imposed on a capacitor must be kept within specified limits.

Capacitors are rated for specific value of microfarads and voltage. The voltage rating is generally the line voltage of the motor but well designed capacitors can stand up to 25% over-voltage.

The microfarad rating may be a single number as 100 MF or two ratings as 108-120 MF. In the first case, the actual rating is 10 to 20 higher, in the second case the normal rating is between the two figures.

Replacement capacitors must be of the same rating as to voltage and microfarad rating. A capacitor of lower microfarad rating will reduce the starting torque but will increase the voltage across the capacitor and a shorter life will result. Increasing the microfarad rating will reduce the pull-in torque and change the starting characteristics of the motor but will not harm the capacitor.

In all cases, the repairman should keep the rating of replacement capacitors to the original values and type of the defective capacitor that is being replaced.

The microfarad rating required for a motor can be estimated by the following formula:

$$\text{Microfarads} = \frac{A \times C}{E}$$

Where A = 6366 for 25 cycles
A = 5305 for 30 cycles
A = 3183 for 50 cycles
A = 2650 for 60 cycles
E = rated line voltage
C = 2½ times the full load current.

For example, consider a ¼ hp, 110 volt, 60 cycle, 1725 rpm single phase motor with a full load rating of 1.8 amperes. Then the microfarad rating should be $(2650 \times 1.8 \times 2.5) \div 110 = 108.4$ mf at 110 volts. A capacitor rated at 110 volts and 108-120 microfarads could be used.

For a ½ hp, 110 volt, 6 pole, 1140 rpm, 60 cycle motor rated at 3.56 amperes at full load, the capacitor would require a rating of $(2650 \times 3.56 \times 2.5) \div 110 = 213.5$ microfarads. A capacitor rated at 110 volts and 216-240 mf could be used.

This method of computing the capacitor rating for a motor is only approximate and should be checked by testing the motor at rated load and horsepower to insure that all items are satisfactory.

The split phase type of motor can be converted to the capacitor start type by two methods (1) by trying various ratings of capacitors, (2) by rewinding.

The first method consists of trying different microfarad ratings and checking the starting torque and current until a suitable balance is obtained, using the formulas above to select the initial microfarad rating.

By test it will be found that a certain microfarad rating will produce the same starting torque but with the locked rotor current reduced 40%. Then trying higher ratings such as 150 or 200 microfarads, it will be found that the starting torque will increase in proportion to the increase in microfarads, with a reduction in locked rotor current.

Thus final selection of the best microfarad rating for the capacitor is by figuring and then cut and try by testing various microfarad ratings.

When rewinding a split phase motor to a capacitor start type of winding, take the split phase data, then use 25% to 40% more turns in the new starting winding than the turns used in the old main winding and change the wire size to approximately one-half the current carrying capacity of the old main winding. The new starting winding wire size, in general, may run about twice the carrying capacity of the old split phase starting winding wire.

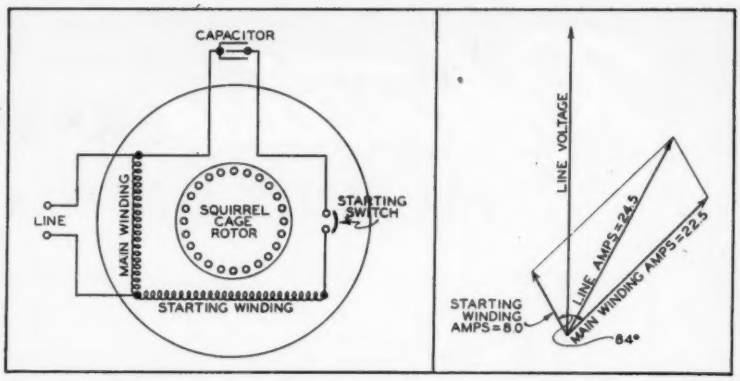

Fig. 2. Left, typical circuit of capacitor-start motor. Starting switch opens after motor starts, disconnecting capacitor from the circuit and opening the starting winding. The diagram at right shows the phase relations of current and voltage in a 1/3 hp, 4-pole, 60 cycle, 110 volt high torque motor of the capacitor-start type. This motor had starting torque of 65 ounce-feet and full load torque of 16 ounce-feet.

The capacitor microfarad rating can be determined as above and the motor tested for refined ratings. A rough value would be 100-120 microfarads at 110 volts, for a ¼ hp, 60 cycle motor.

With capacitor start motors any change in the line voltage of more than 10% will require a change in the microfarad and voltage rating of the capacitor. For example, changing a winding from 110 to 220 volts would require a 220 volt capacitor of one-quarter the microfarad rating. If for example the 110 volt, ¼ hp, 4 pole, 60 cycle motor was changed to 220 volts, then microfarads = $(2650 \times .8 \times 2.5) \div 220 = 24.1$ mf. The 110 volt capacitor is 108.1/24.1 = 4½ times that required for the 220 volt motor.

Thus voltage changes on motors using capacitors must be checked to insure proper capacitor ratings in microfarads and voltage.

In conclusion, it can be stated that the capacitor start motors will produce higher starting torque at lower current than the split phase type, and when carefully done, the capacitor start principle can be adapted to the split phase motor where higher starting torque or lower sarting current is desired.

Electric Heat for War

An electric furnace produces heat exceeding 3,500 degrees centigrade and can melt 25 tons of iron and steel at one time to produce the highest quality of steel for America's implements of war.

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With most of our lumbermen handling knives and walnut gun stocks instead of axes and cedar, pole replacements are somewhat of a problem in many localities. Add to this, the difficulties of shipping and handling heavy materials amidst war time traffic congestion and the result is a scarcity of poles for some of our Utility Companies.

The problem is being partially solved on a temporary basis by pole stubbing. Discarded poles with rotted bottoms but firm wood above the original ground line are used as stubs. After cutting away the rotted butt and treating, stubs are set alongside the pole which is in service but in need of replacement. Hubbard Sleeve-Nut Bands are installed as shown in the diagrams.

Given a solid setting for the stub, the resultant structure will hold to the breaking strength of the average pole, as illustrated by the accompanying photo of a test.

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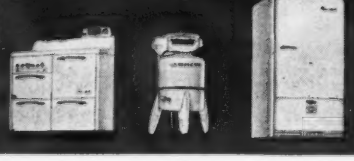
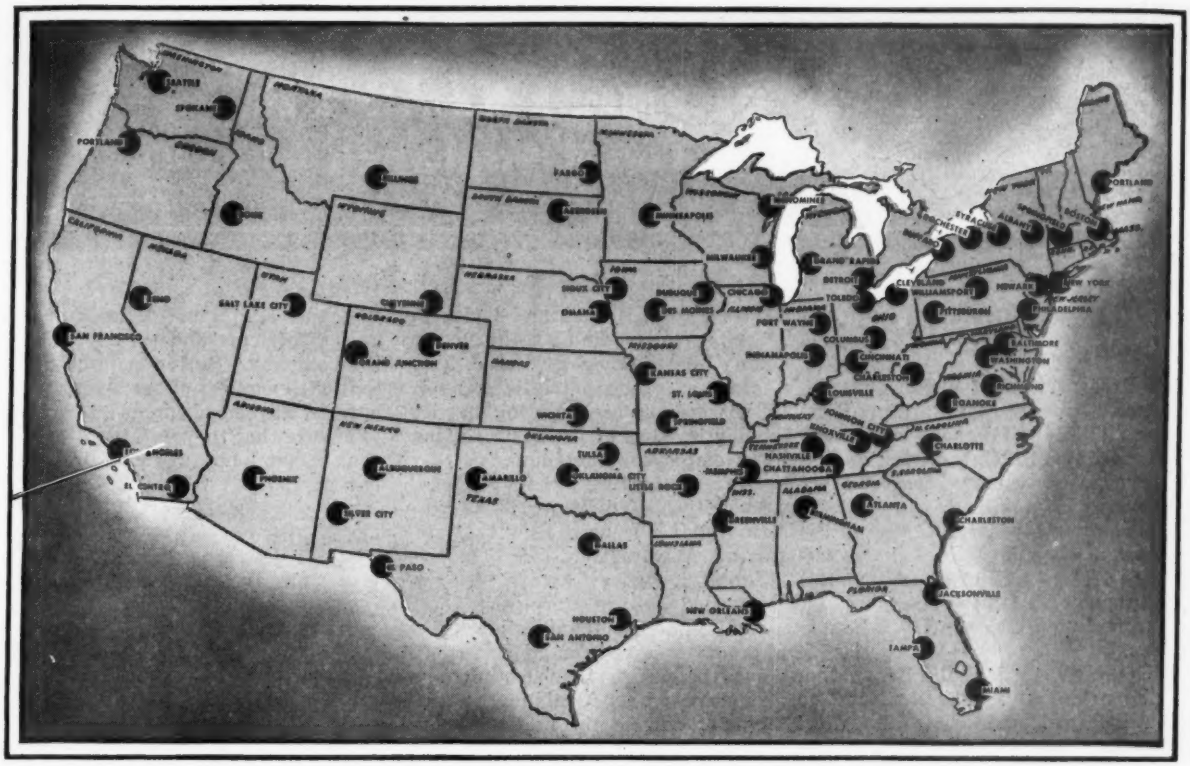


ARMY E NAVY
"...for outstanding production of war material."



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NEWS of the INDUSTRY
National and Southern

Carolina Utility Honored by OCD

Presentation of a National Security Award to the Carolina Power and Light Company was made June 22 at Raleigh during an impressive ceremony featured by several brief talks.

The award was presented to the company by the United States Office of Civilian Defense for "maintenance of a superior standard of protection and security of service."

Governor J. Melville Broughton, the principal speaker, said, "The utilities companies of America, including the Carolina Power and Light Company . . . had the first responsibility of security in this war. When the war first started, such companies were urged to take necessary steps of precaution against sabotage, and this they did effectively."

Governor Broughton declared, "Employees of the Carolina Power and Light Company have kept things safe in a patriotic manner. Our soldiers are winning battles today because of the sort of thing you employees have done."

In presenting the National Security Award, Major D. A. Herrin of the Fourth Service Command, Atlanta, Ga., said, "The National Security Award is not awarded to the Carolina Power and Light Company simply because you have been good citizens, but the entire firm has done a superior job in furnishing security, not only to the neighbors but to the boys overseas. The boys over there want America to be secure, they want to return to a secure world, and you certainly have contributed to that security."

The award was accepted by L. V. Sutton, president of the Carolina Power and Light Company, who expressed appreciation on behalf of officers and employees of the company. Sutton pointed out that 351 members of the firm have entered the armed forces and said, "I'm sure that they will be pleased that we at home are carrying on our part."

H. B. Robinson, vice president of Carolina Power and Light, after accepting the NSA flag, expressed appreciation to the employees of the company for their fine work, and to the Federal Power Commission, the Army and the OCD for their cooperation and help in the setting up of the company's protective organization to guard its plants.

H. B. Robinson, extreme left, and R. L. McMillan, extreme right, hold the national Security flag presented to the Carolina Power and Light Company in a ceremony in Raleigh, June 22. Left to right: Vice-President Robinson of the company; Frank Daniels, Wake County chairman of Civilian Defense; Col. William S. Pritchard, of Fort Bragg, internal security officer for North Carolina; Lt. Joseph Sibley, Navy representative; Governor Broughton; Major D. A. Herrin of the Fourth Service Command, Atlanta, who presented the Security Award to President Sutton; L. V. Sutton, president of the C.P.&L.; Mayor Graham H. Andrews; and State Civilian Defense Director McMillan. In the background is the company's service flag, with 351 stars.

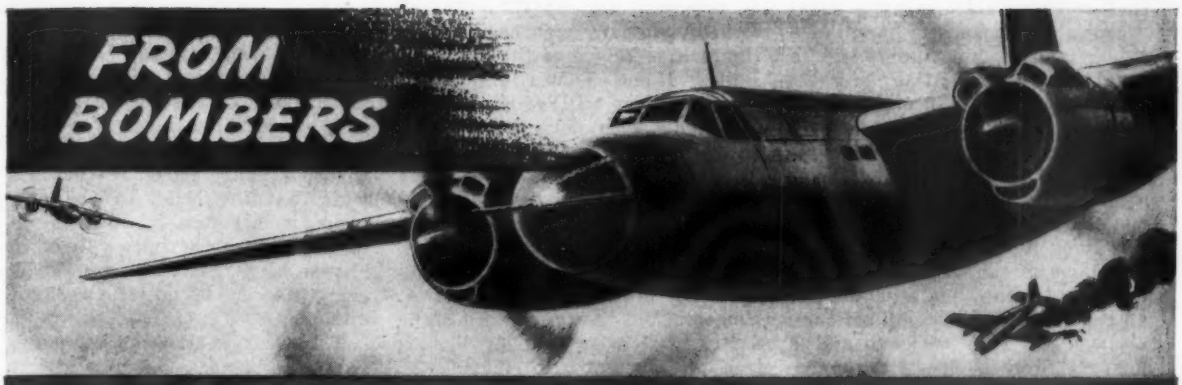
Electrical Leagues Hold Annual Meeting in Detroit

During the past year, electrical leagues have been directing a good share of their operations to the development of plans to provide more jobs after the war. This will be the general theme of the Ninth Annual Conference of the International Association of Electrical Leagues, which is scheduled to be held in Detroit, Wednesday, Thursday and Friday, September 20, 21 and 22.

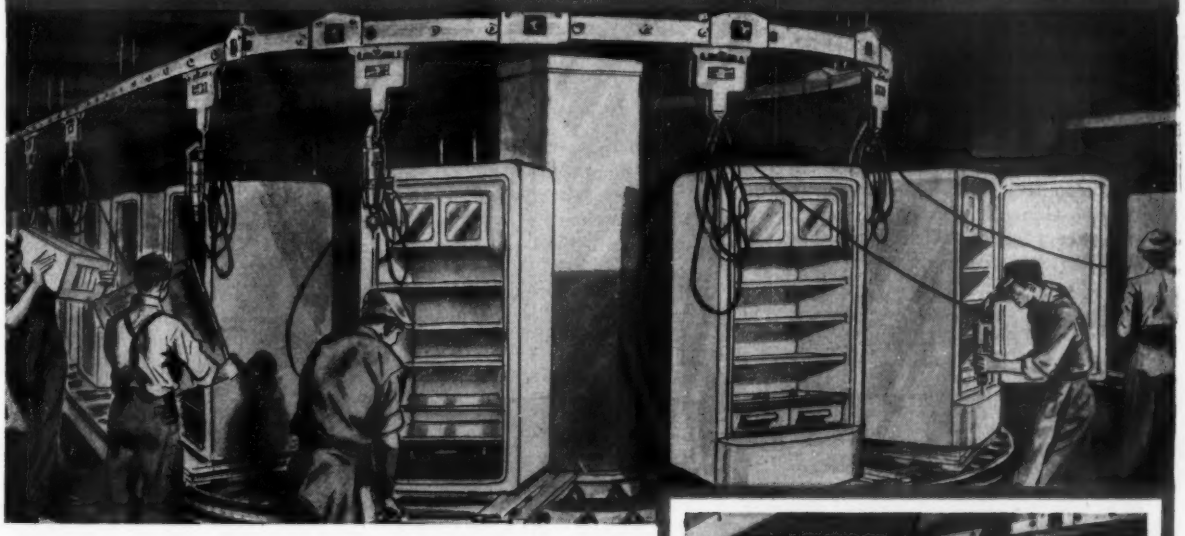
W. A. Ritt, Minneapolis, IAEL president, has appointed a Program Committee consisting of J. A. Morrison, Philadelphia, chairman, J. S. Bartlett, Washington, D. C., and Ralph Neumuller, New York, N. Y.

Some of the important subjects being considered for inclusion in the program are:

Future of lighting in the commercial and industrial markets; electrical opportunities for equipping and modernizing industrial plants and commercial occupancies; electronics in industry and other fields; job possibilities in the electrical industry; home planners' institute programs, expanding the builders' market with the plus-value of complete electri-



... BACK TO PEACETIME PRODUCTS



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There's a big peacetime job ahead for portable tools, cranes, hoists and other "moving loads" . . . as big a job as they have had in the last three years of war production.

And, when reconversion starts, plants equipped with BullDog Industrial Trol-E-Duct will find their mobile power problems solved.

Only Industrial Trol-E-Duct has fully met the need for safe, convenient, flexible power that travels along with the tool or other moving load. Like other BullDog bus duct systems, it can be quickly moved to any location — readily adapted to any shop set-up.

We invite you to call on expert BullDog engineers for help in your reconversion planning — and we'll send descriptive folders promptly on request.

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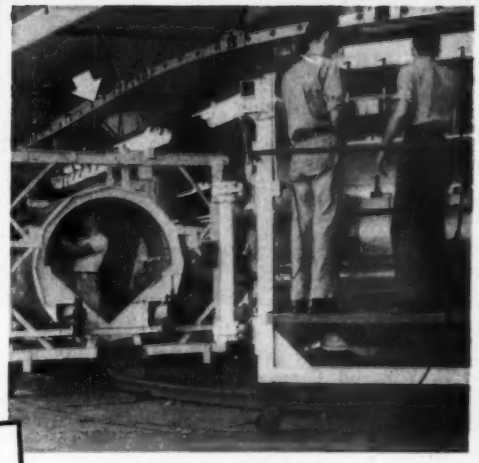

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fied homes; establishing a local potential for postwar appliance sales; and a new approach to rural and residential markets through consumer interests.

The general sessions, which will be held on Wednesday and Thursday, are open to representatives of all electrical leagues and other members of the electrical industry. Part of the morning and the afternoon of the third day will be devoted to the business affairs of the IAEL, reports of officers, election of 1945 officers and a general discussion of league activities.

Georgia Power Sponsors Better Towns Program

A comprehensive plan by which Georgia communities, through community action, can make Georgia agriculturally and industrially wealthier, more attractive to tourists, and a pleasanter place in which to live, has been prepared by the Georgia Power Company and presented to its division vice presidents at a recent meeting in Atlanta.

The plan, evolved after months of research and careful preparation by company men assigned to the task, is known as the "Georgia Better Home Towns Program." The program will work in conjunction with other agencies throughout the state that are seeking to accomplish the same aims.

Directing the company program is C. A. Collier, vice president. Assisting Mr. Collier in direction from the general office are H. A. Smeeton and George Brodnax, the latter as field supervisor.

Each company division will have a Better Home Towns representative who will report to the division vice president.

The five goals of a Better Home Town, as listed in a plan of action, are:

(1) Attractive employment for returning servicemen and war workers, and for present and future citizens.

(2) Promising opportunities for the advancement of all.

(3) Comfortable living conditions for citizens and visitors.

(4) Modern schools and good churches.

(5) Pleasant recreational and social facilities for citizens.

Any community attaining these goals will individually benefit from it. And if many different communities adopt the program and make a success of it, Georgia as a whole will benefit. For these reasons, the company will attempt to "sell" the program far and wide, but the heart of the program is community action. In each place, the activity will be in charge of a "Better Home Town" committee made up of the local citizens.

The Georgia Power Company's part will be to assist in any way it can. It offers to do these things for every community which wishes its cooperation:

(1) Assist local postwar committees already organized, or suggest ways and means for organizing new groups to analyze the community's needs.

(2) Provide free literature, advertising and publicity to enlist and stimulate the interest of all citizens in the program.

(3) Stimulate agricultural progress in the surrounding area. The company's agricultural division and engineers will cooperate with individual farmers, the county agent, specialists of the Georgia Agricultural Extension Service and other farm agencies in analyzing new opportunities for farms in the neighborhood and in promoting the crops and agricultural methods best suited to them.

(4) Supply, free of charge, the services of its experienced industry planners and promoters. Through research these men will help determine the most promising industries for a community. And they will make available to

CLEAN SWEEP FOR CHROMALOX—E. N. Calhoun, president, Edwin L. Wiegand Company, manufacturers of Chromalox heating units, explains slogan used as a theme during Chromalox Engineering Conference held in Pittsburgh June 22-23 to Mark Greer, engineering vice president (center) and Bruce Fleming, vice president of sales (right). The representatives were requested to take the new brooms home with them and hang them up in their offices as a constant reminder to "Sweep Away Complacency." Remarkable progress in the development of electrical heating equipment during the past decade was shown by contrasting Chromalox products of ten years ago and today. Many demonstrations were given showing how the use of electric heat had advanced the production of war material, and how it will assist in peace-time production. The group photo shows Chromalox engineering and service representatives from the United States and Canada, who gathered in Pittsburgh for annual Sales and Engineering Conference. In the foreground (center) is E. N. Calhoun, president, (left) Bruce Fleming, vice president of sales, (right) Mark Greer, vice president of engineering.

STOP! GO! AHEAD WITH Lloyd New Automatic Starter

Submitted to Underwriters' Laboratories Inc., for approval.

Submitted to Electrical Testing Laboratories, Inc., for certification.

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Locks Out . . . Resets AUTOMATICALLY

NEW AND DIFFERENT. The most effective starter yet produced.
Outstanding contribution to effective operation of fluorescent lamps.

1. Positively cuts out deactivated, flickering, blinking lamps.
2. When trouble is detected the starter automatically cuts off current to the ballast and lamp.
3. Gives long life to ballast because defective lamp is locked out. Prevents overheating.
4. When Lloyd AUTOMATIC locks out defective lamp —turn off the current—Remove defective lamp—Put in a new lamp.

   Allow at least one minute to make the above change of lamps. Turn on current. The starter automatically lights the new lamp.

   NO NEED TO DO ANYTHING TO THE STARTER
5. Lloyd NEW PLASTIC CAN has higher dielectric strength, is stronger, lighter, distinctive.
6. Knurled rim on plastic can insures positive grip for insertion and removal of starter.
7. Plastic can is sealed. No projecting lugs to cause trouble.
8. The life of the AUTOMATIC starter is many times greater than that of the average lamp.
9. It saves maintenance costs and power consumption. protects and insures longer life to the ballast and lamp.
10. Tested in production and prior to shipments to insure perfect performance.

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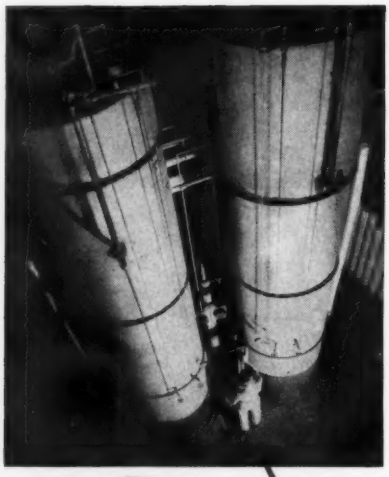
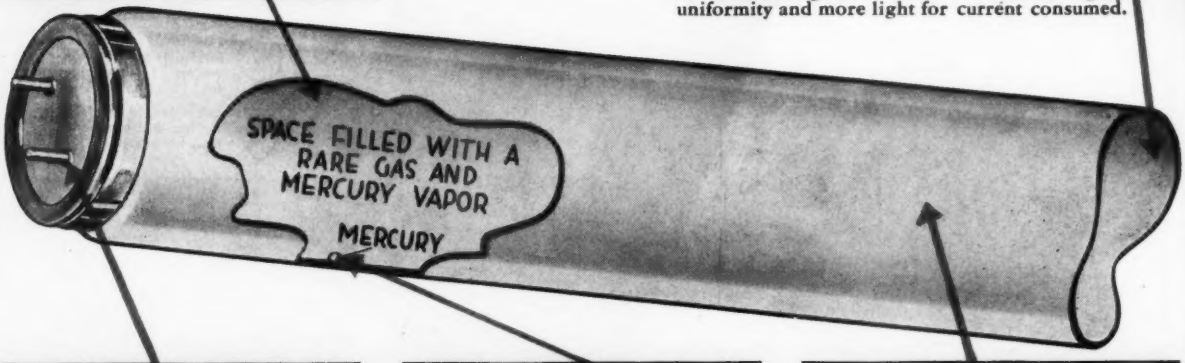


1 304° below zero sounds pretty cold. Freezing argon gas at this temperature means drier, purer gas making starting easier, more uniform.

2 Improved phosphor powders used in coating the inside of G-E fluorescent lamps result from constant testing and research. This means higher uniformity and more light for current consumed.



5 The "Twist Test" checks G-E lamp ruggedness to withstand twists, strains, bumps. This test applies pressure to the base, pins and tubes.

6 A tiny drop of mercury is accurately measured and injected by automatic machines to give G-E lamps better, lower-cost performance.

7 More than 480 tests and inspections guard the high quality of G-E Fluorescent lamps. Here G-E lamps are checked during the "seasoning" process.

Hear the General Electric radio programs: "The G-E All-Girl Orchestra," Sunday 10 p.m., EWT, NBC; "The World Today" news, every weekday, 6:45 p.m., EWT, CBS.

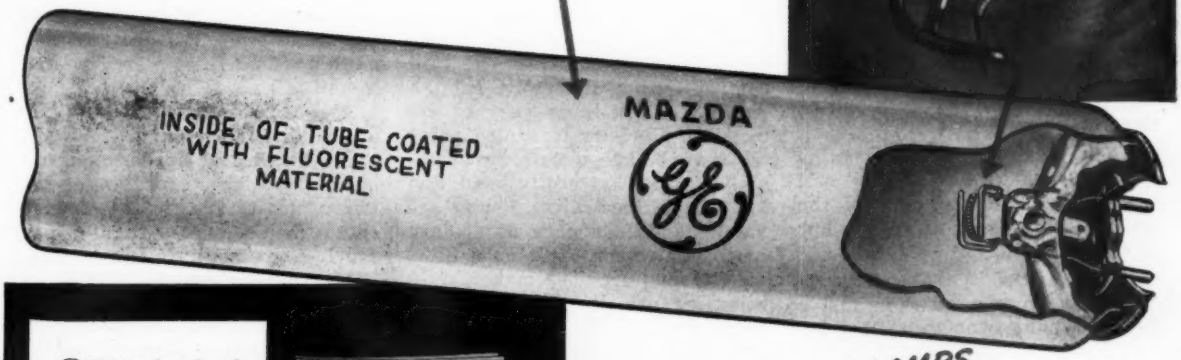
GENERAL ELECTRIC

a G-E FLUORESCENT LAMP

Chances are that you'll never examine what's inside a fluorescent lamp. But G-E engineers have done it—hundreds of thousands of times—in a constant, never-ending search for better and better lamp performance. Here are a few facts they've found out, while seeking more efficient, better lighting quality for fluorescent lamp users.

3 This instrument, the world's largest spectroscope, sets exact color standards for G-E lamps and provides assurance of correct color quality.

4 This coated cathode—here magnified many times—shows the sound, rugged construction which is built into every part of G-E fluorescent lamps.

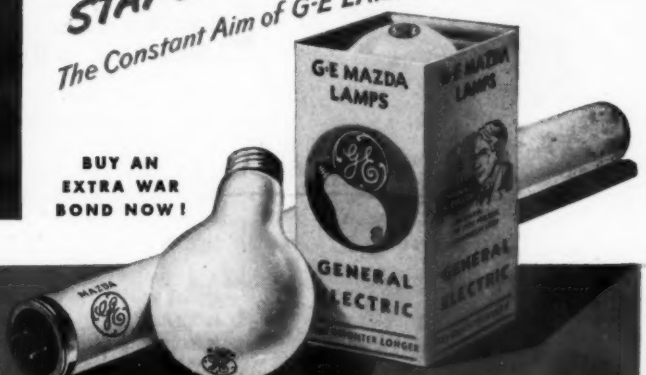


8 This is a barehanded facts about G-E fluorescent lamps—the better lamps that give more and more light at lower cost than ever before. For all the FACTS write for this FREE booklet, Y-432. General Electric, Dept. ES-H, Nela Park, Cleveland 12, Ohio.

"TO MAKE G-E LAMPS STAY BRIGHTER LONGER"

The Constant Aim of G-E LAMP RESEARCH

BUY AN EXTRA WAR BOND NOW!



G-E MAZDA LAMPS

each community, for use by its Better Home Town Committee, the enormous files of data on industrial sites and desirable types of small industries for Georgia towns.

(5) Furnish, free of charge, to communities which wish to survey their municipal services and properties, the services of experienced company engineers. These trained men will confer and advise with community officials to determine practical expansion of their municipal service.

(6) Publish a series of advertisements in national and industry magazines, designed to spotlight Georgia's resources and opportunities.

Sally Silex Makes Debut Before Millions

"Sally Silex" is the pert new trade character now being featured in an extensive advertising campaign by The Silex Company. "Sally" is scheduled to be presented in fully 180,000,000 national magazine impressions during 1944. The list of 16 publications includes such important magazines as Life, Saturday Evening Post, McCall's, Good Housekeeping, American Home and Country Gentleman.

The slogan "Only a Genuine Silex can make Silex Coffee" will also be an important part of the advertising, as well as the window and store displays.

"Sally Silex" is expected to reveal herself as more than just a pretty, young woman. The Silex Company reports that a great deal of care has gone into making sure that her face and personality are not only attractive and attention compelling but distinctive enough so that she will be easy to remember. Her creators also point out that she has something worthwhile inside that pretty head. She knows, authoritatively, how to handle and take care of modern home equipment, such as a Silex glass vacuum coffee maker, or a Silex automatic electric steam iron. And she'll help to guide American housewives on these matters as well as on the details of gracious service and hospitality.

"Sally Silex," pert new trade character now being featured in extensive advertising campaign of The Silex Company.

Dealer to Electrical South's representative: "And you can quote me, 'We dealers, hardened and toughened by having to work for a living, are not going to stand for any nonsense from manufacturers grown soft on government's payroll.'"

BullDog Sales Clinic Conducted in Detroit

New product improvements and ways of better serving customers in spite of wartime conditions were top-ranking considerations when the Central Group, BullDog Field Engineers, met July 10-14 at the Wardell Hotel, Detroit.

J. J. Mitchell, vice president in charge of sales, opened the clinic with a special address, and Al Togesen, special field engineer, conducted the illustrated lectures. Estimating and engineering details concerning derating, panelboards, Circuit Master Breakers, Vacu-break switches, Universal and Industrial Trol-E-Duct, and BUStribution Duct were covered in the talks.

A special feature of the clinic was a daily luncheon meeting with plant department heads to discuss means for closer coordination between factory and field personnel. Clinic members also spent a day touring the main BullDog plant, 7610 Joseph Campau, Detroit.

New Chairman Appointed For A-W Plan Committee

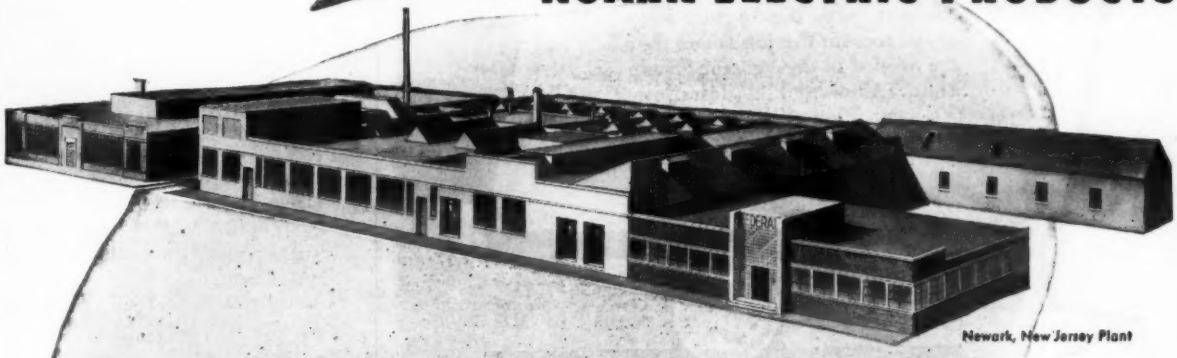
J. S. Bartlett, managing director, The Electric Institute of Washington, D. C., has been appointed chairman of the Plan Committee of the National Adequate Wiring Bureau, succeeding C. M. Fife, of West Penn Power Co., who found it necessary to resign because of the pressure of additional company duties. The appointment of Mr. Bartlett was made by Herbert Metz, chairman of NAWB's executive committee.

At the same time, announcement was made that John A. Morrison, managing director of The Electrical Association of Philadelphia and a league representative on the Plan Committee, has been appointed to the executive committee in place of Mr. Bartlett.

THE HOME OF THESE*

Federal

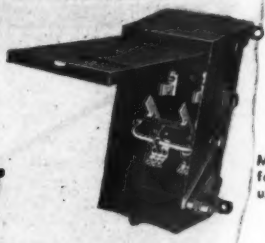
NOARK ELECTRIC PRODUCTS



Newark, New Jersey Plant

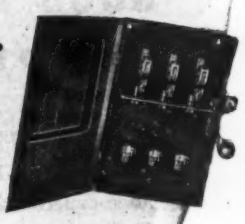
MAKING HISTORY *Today*

ON THE FIGHTING FRONT



Maritime Switch for Shipboard use

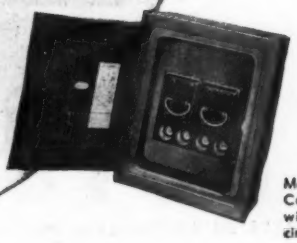
ON THE INDUSTRIAL FRONT



600 Volt Rotarc Type Knife Blade Switch

Tomorrow

ON THE HOME FRONT



Main and Range Combination with 4 lighting circuits

FEDERAL ELECTRIC PRODUCTS COMPANY

PLANTS AT: 1429 PARK STREET, HARTFORD, CONNECTICUT AND 50 PARIS STREET, NEWARK, NEW JERSEY

It's just *GOOD BUSINESS* to keep appliances on the job for the duration . . .

So get back of the National Appliance Conservation Plan — now! Another good idea to help keep appliances on the job *where they are needed* is the Proctor "Swap Plan." (A few booklets describing the Swap Plan still available on request.)

BETTER CARE — MANUFACTURER • WHOLESALER • CONSERVE Electric Servant UTILITY • DEALER — LESS REPAIR

GOOD BUSINESS after the war . . .

Get ready for good post-war business, because *Proctor will be ready* with surprise features in appliance construction, new wrinkles in appliance merchandising! Meanwhile, let's all *"Back the Attack"* with War Bonds.

PROCTOR

NEWSMAKER IN APPLIANCE MERCHANDISING

PROCTOR ELECTRIC COMPANY—*DIVISION*, PROCTOR & SCHWARTZ, INC., PHILADELPHIA 40, PA.

Exchange Committee Chairmen Appointed

R. Paul Smith, president of the Southeastern Electric Excange, has appointed section chairmen to head up Exchange activities in the forthcoming administrative year. The four sections and their chairmen are:

Accounting—Robert E. Howard, Jr., general auditor, Alabama Power Co., Birmingham.

Commercial — Hugh G. Isley, general sales manager, Carolina Power and Light Co., Raleigh.

Employee Activities—Homer M. Pace, vice president, South Carolina Power Co., Charleston.

Engineering and Operation — Henry B. Sargent, vice president and general manager, Mississippi Power and Light Co., Jackson.

The Commercial Section also includes five sub-committees. The chairmen of these groups are:

Residential and Commercial—J. S. Sutherland, Alabama Power Co., Birmingham.

Industrial Power—C. E. Anderson, Virginia Electric and Power Co., Charlottsville.

Agricultural Development — Dan E. Stewart, Carolina Power and Light Co., Raleigh.

Advertising — E. Keith Hartzell, East Tennessee Light and Power Co., Bristol.

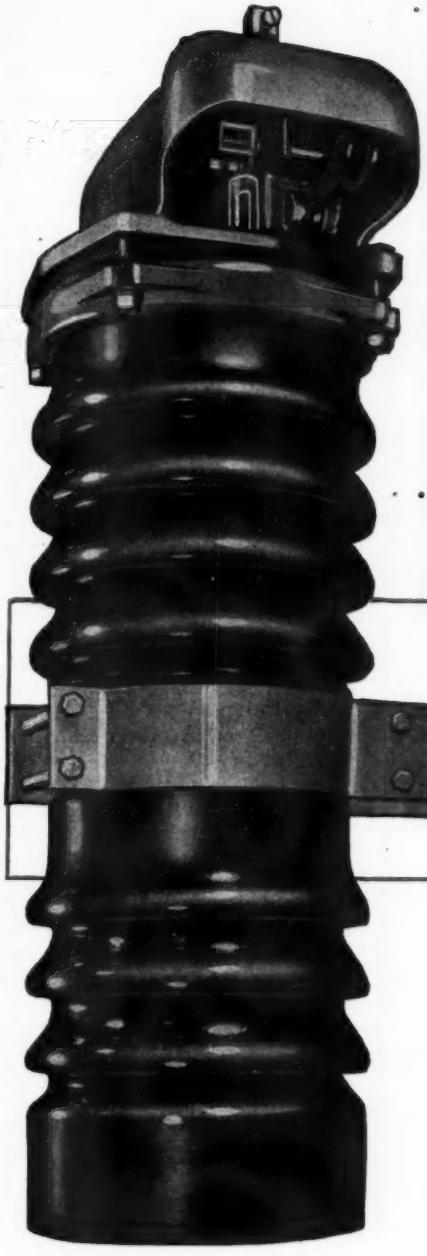
Standardization of Electric Water Heaters — W. B. Farnsworth, Georgia Power Co., Atlanta.

The fall conference of the Engineering and Operation Section has been scheduled tentatively for September 21 and 22, in New Orleans, La.

Carolina Inspectors Hold Annual Meeting

The annual Institute for Electrical Inspectors, Contractors and Electricians sponsored by the North Carolina Chapter of the International Association of Electrical Inspectors, the North Carolina Board of Examiners of Electrical Contractors, and the North Carolina Association of Electrical Contractors was held at Raleigh, N. C., July 11-12. Assisting in sponsoring the program were the electrical engineering department of North Carolina State College, where the sessions were held, and the North Carolina State Insurance Department.

Speakers and their topics included: Roy A. Palmer, of the

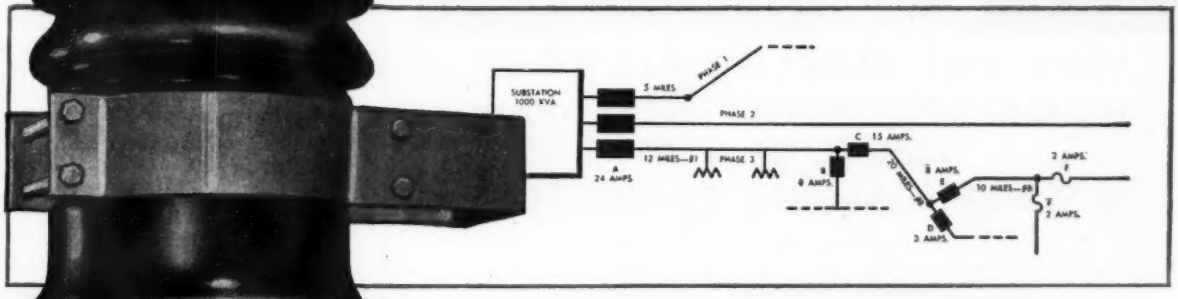


ISOLATE FAULTS

ON RURAL LINES

. . . by accurately co-ordinated circuit protection with the new

Westinghouse AR-I Automatic Recloser



Over 80% of all faults are of a *temporary* nature.

Westinghouse engineers have utilized this fact—with the result that the great majority of rural line outages and service trips are now unnecessary! They have developed the Westinghouse AR-1 Automatic Recloser which discriminates between permanent and temporary faults!

The recloser interrupts *all* faults—but recloses and restores service on temporary faults. On permanent faults, it locks out and must be reset by hookstick.

Time-lag tripping permits accurate co-ordination with other reclosers and with standard fuses. Length of line out of service is reduced to an absolute minimum.

Data telling you how to select and co-ordinate the recloser with other circuit protection are now available in book form. Write for your copy of B-3329. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pennsylvania, Dept. 7-N. J-60545

TIME-LAG TRIPPING

PERMITS

- Co-ordinating reclosers with each other and with fuses
- Burning faults clear and restoring service
- Energizing line after lock-out without by-pass switch

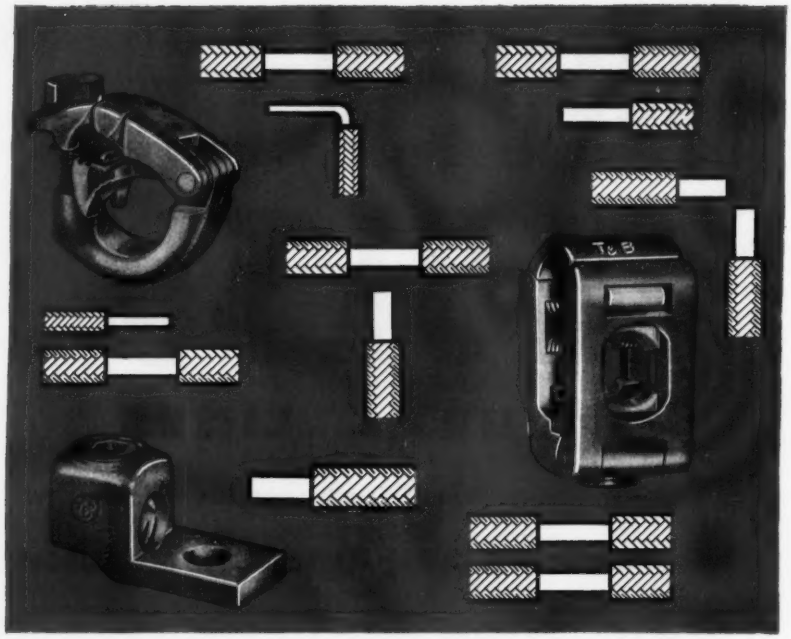
PREVENTS

- Simultaneous tripping of reclosers
- Unnecessary tripping on momentary overloads
- Chattering
- Tripping of immediate and preceding reclosers when re-energizing line

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

AR-I RECLOSERS



WHY NOT *SIMPLIFY* ALL YOUR HOOK-UPS WITH THESE FEW

T&B LOCK-TITE

PRESSURE *(Solderless)* CONNECTORS

A SMALL assortment—a handful—of these Approved T&B Lock-Tite Pressure Connectors will take care of practically all the lugging and tapping you are ever likely to do.

Each connector takes several overlapping cable sizes up to 1000 MCM, and handles any type; solid. stranded, flexible, extra-flexible, hemp-core, rod or tubing.

Being salvageable, T&B Lock-Tites can be used over and over again.

Being solderless, the electrician on the job finds them simple to install. He is confident of a perfect electrical and mechanical connection, even under continuous vibration.

It is easy to see how this T&B Lock-Tite Line simplifies your stock and inventory problems.

Ordering them is simple, too. Your nearby T&B Electrical Wholesaler carries them in stock.

Write Dept. E S-8 for Maintenance and Repair Booklet giving all the dope on this Lock-Tite Line.

The Thomas & Betts Co., Incorporated
518 Masonic Temple Bldg.
New Orleans 12, La.

The Thomas & Betts Co., Incorporated
P. O. Box 2372
Charlotte, North Carolina

The Thomas & Betts Co., Incorporated
Room 423
Citizens & Southern Bldg.
Atlanta 3, Ga.

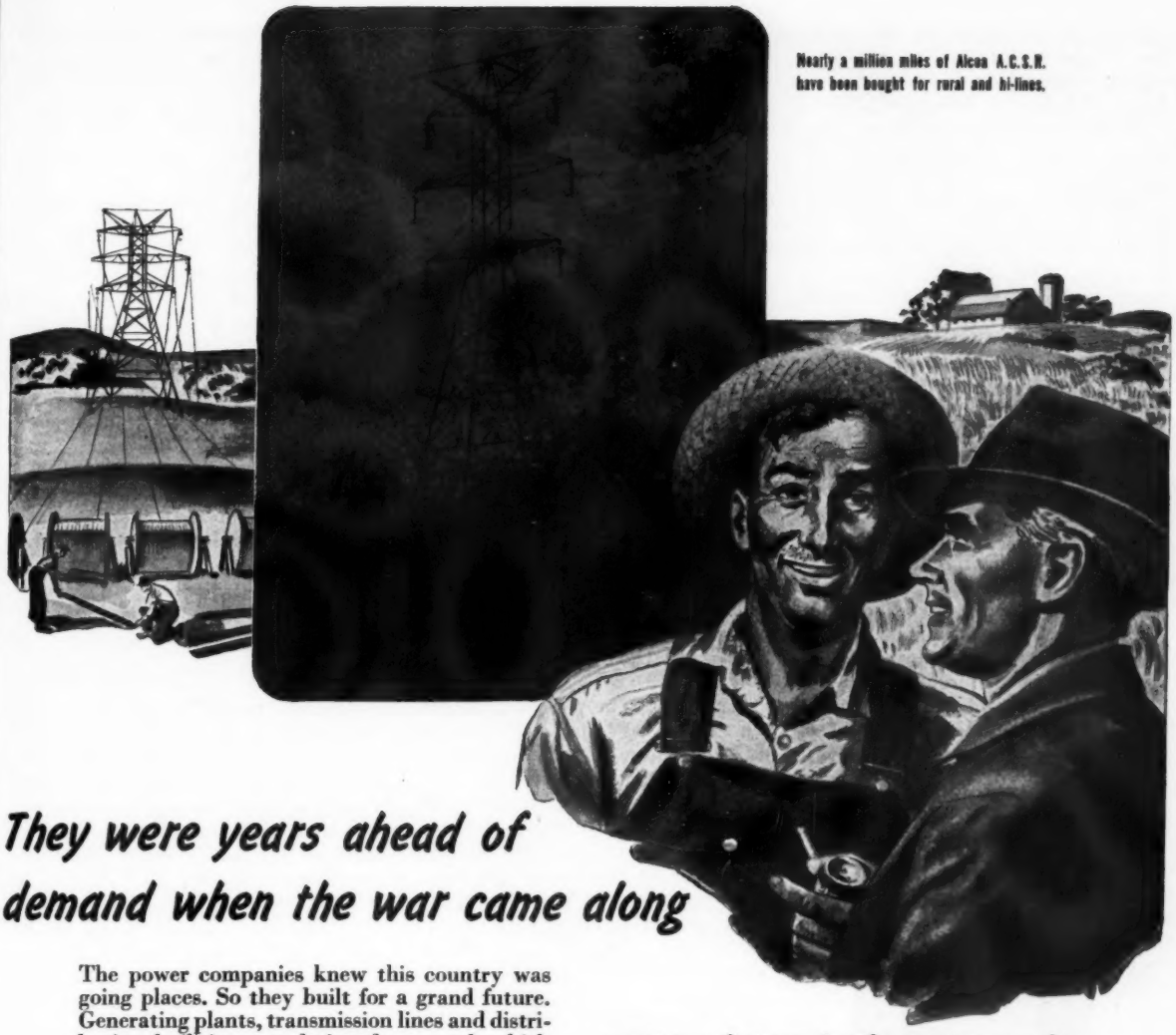
T&B THE THOMAS & BETTS CO.
INCORPORATED
manufacturers of electrical fittings since 1899
ELIZABETH 1, NEW JERSEY

Duke Power Company, Charlotte, N. C., "What Does the Future Hold for Lighting?"; Lee F. Adams, of the General Electric Company, Schenectady, N. Y., "Electrical Industry's Contribution to the War"; Arthur L. Abbott, of the National Electrical Manufacturers Association, New York, "Feeders and Branch Circuits"; L. M. Keever, of Raleigh, N. C., professor of electrical engineering at North Carolina State College, "Tools for the Inspectors"; H. G. Knoderer, of Bridgeport, Conn., commercial engineer of the General Electric Company, "Government Disposal of Surplus Material"; James S. Mahan, of Fustat Manufacturers, Chicago, Ill., "Type 'S' Fuses."

Other speakers included: William P. Hodges, of Raleigh, North Carolina commissioner of insurance; G. B. Price, chairman of the North Carolina Rural Electrification Authority, who discussed rural electrification; A. Yates Arledge, of Raleigh, chief counsel for the Carolina Power and Light Company, who discussed the legal aspects of inspection; Victor H. Tousley, secretary-treasurer of the International Association of Electrical Inspectors, who spoke on postwar committees; and Howard H. Weber, of New York, assistant manager of wire sales for U. S. Rubber Products, Inc.; and Governor J. M. Broughton of North Carolina.

A feature of the institute was an analysis and discussion of problems in locating and correcting troubles in various types of electrical appliances and equipment, with the following speakers being heard: Ralph Martin, of Raleigh, residences; Harvey Flynt, of Winston-Salem, N. C., motors; P. F. McGuirt, of Charlotte, N. C., garages; C. T. Johnson, of Asheville, N. C., theatres; F. E. Hartis, of Raleigh, N. C., heating systems and controls; C. S. Whitaker, of Durham, N. C., beauty parlors and barber shops; W. A. Darden, of Greenville, N. C., three-phase, four-wire system.

Object of the Institute, which was presided over by N. E. Canaday, of Raleigh, North Carolina state electrical engineer and inspector of the state of North Carolina, is to formulate standards for safe installation and use of electrical materials, devices and appliances; to collect and distribute



Nearly a million miles of Alcoa A.C.S.R. have been bought for rural and hi-lines.

They were years ahead of demand when the war came along

The power companies knew this country was going places. So they built for a grand future. Generating plants, transmission lines and distribution facilities were designed on a scale which would place no limitations on that growth.

Then came the war. The country's demands for electricity soon gobbled up surpluses of generation and distribution. A power famine threatened.

But the utilities saved the day. Not only did they cut into service every ounce of reserve, but they uncovered an ingenuity which made heavy producers out of middleweight equipment. Generators, transformers, switching apparatus, all have been overloaded to the point of exhaustion, cancelling much from their life expectancy, but carrying the country over the hump.

Power lines and underground cables have been loaded to suit the weather, running hotter on cool days, when excess heat could be dissipated. Substitute materials and makeshift methods were employed, just as in other industries, to patch up and extend vital lines. Critical materials were saved for war.

So, hats off to the public utilities! They've done a marvelous job.

ALUMINUM COMPANY OF AMERICA, 2164 Gulf Building, Pittsburgh 19, Pennsylvania.

ALCOA A·C·S·R

ALCOA ALUMINUM

information relative to the safe use of electricity; and to promote closer cooperation between members of industry and the public.

Held in connection with the institute was the annual meeting of the North Carolina Chapter of the International Association of Electrical Inspectors of which N. E. Cannady, of Raleigh, is chairman and C. S. Whitaker, of Durham, is secretary-treasurer. Both Cannady and Whitaker were re-elected.

Sweatt Succeeds Eaton As President Miss. Power Co.

L. P. Sweatt, who since 1930 has been vice president and general manager of the Mississippi Power Company, was elected president and general manager at a meeting of the company's board of directors held in Gulfport recently and following adoption of resolutions of sympathy addressed by the board to the family of B. E. Eaton, late president and general counsel, who served as president for two decades and whom Mr. Sweatt succeeds in this capacity.

L. P. Sweatt

Mr. Eaton, native Mississippian and lifelong resident of the state, was born at Taylorsville, where he received his elementary education. He graduated from Millsaps College in 1901, obtained his LL.B. degree there in 1903, and was honored by his alma mater with a doctor's degree in 1922.

From 1906 to 1909 Mr. Eaton was district attorney of the 13th Mississippi District. From 1909 to 1911 he was attorney for the Gulf and Ship Island Railroad, residing in Gulfport, and from 1911 to 1924 served as the road's general counsel. Late in 1924 Mr. Eaton was elected president and general counsel of the newly organized Mississippi Power Company, which position he held until his death.

Mr. Sweatt was born at Montgomery, Ala. He received his elementary education in Montgomery and at Birmingham. In 1915 he graduated from Alabama Polytechnic Institute with a B.S. degree in Electrical Engineering.

Following graduation he immediately entered the employ of Alabama Power Company on substation construction and maintenance and was progressively advanced through various phases of electric utility operation. In 1924, he was serving as division manager of that company's operations in the Montgomery area.

In November 1924 he was appointed general manager of Mississippi Power Company by Mr. Eaton, then newly elected president of that company which was preparting to start initial operations on the Mississippi Gulf Coast.

Mr. Sweatt moved to Gulfport, where he lives today with his wife and daughter, and has continued as general maanger of the company's expanded operations until the present time. He was elected to the vice presidency of the company and as a director in 1930.

A resident of Mississippi for 20 years, Mr. Sweatt has participated in many phases of the states development and has been particularly active in its industrial growth. He is intimately familiar with the state's economic life and has played a large part in its improvement.

Under his management the construction of the extensive electric transmission system now serving eastern Mississippi was pioneered and the first commercial hydro electric power to be made available in Mississippi in the history of the state was delivered over these facilties in August, 1925.

Postwar Appliance Market Subject of Publication

The Appliance Sub-Committee of the Postwar Planning Committee of the National Electrical Wholesalers Association has compiled an interesting report on its study of postwar markets entitled "The Potential Appliance Market in 1946."

This booklet sets forth a formula for the mathematical projection of the market for twenty-one different electrical appliances. It is based upon actual yearly experience from 1933 to 1941 and closely parallels "Markets After the War" by S. Morris Livingston, although commodities other than electrical appliances were grouped together in his study.

The whole study is based upon the number of units of sale, not dollar volume. All prices used are average 1940-41-42 retail list prices. It is national in scope, but the methods can be applied to any local area, by states, counties or even cities and towns.

A copy of the report may be obtained by writing the National Electrical Wholesalers Association, 500 Fifth Ave., New York 18, N. Y. The cost is $1 per copy.

Westinghouse Sets Stage For Postwar Home Freezer

Announcement that home freezers for city and farm will be added to the Westinghouse line of electric appliances will be made to consumers in August, according to T. J. Newcomb, sales manager of the Westinghouse Electric Appliance Division.

In a four-color advertisement designed to promote home food preservation now by canning, brining, drying or freezing, Westinghouse will urge consumers to put up food now by whatever method they have available and after victory to look forward to Westinghouse home freezers. Full pages in The Saturday Evening Post of August 19 and Collier's of September 2 and Good Housekeeping for September will be used, it was announced by Roger H. Bolin, advertising manager of the Westinghouse Electric Appliance Division.

Consumer activity on behalf of the new postwar product will be given intensive trade merchandising support, Mr. Bolin stated. So that retailers may identify themselves locally with the Westinghouse home freezer, easel-type counter cut-outs showing a Westinghouse home freezer being unloaded from a truck, and a 22x28 poster blow-up of the August advertisement will be mailed to all Westinghouse retail outlets in advance of the consumer advertising. Both of these merchandising helps will be in color. A book-

Engineering and Physics Library

let reprint of "The Story of Frozen Foods," by John Nesbitt and a letter and calendar highspotting the campaign will also be furnished Westinghouse retailers at this time.

Entitled, "Winter Forecast: Good Eating Ahead," the initial consumer advertisement has been developed as a part of the current Westinghouse full line advertising program. A full color photograph by Victor Keppler, pictures a typical American family of three carrying into their house the produce from their Victory garden.

"All together now — let's can, brine, dry or freeze every extra speck of food from our Victory gardens and farms. It will assure good eating next winter in spite of any food shortages. Save the surplus — make Food Fight for Freedom," the copy begins.

Later comes the assurance of the new Home Freezer for postwar food preservation — which is in line with a wartime advertising approach, which Westinghouse has helped to make familiar: use what you now have to your patriotic best and count on better things when victory is won.

Colt Electrical Division Acquired By Federal

Months of heightened activity were climaxed on July 1st with the completion of all negotiations and the signing of final papers for the purchase of the Electrical Division of Colt's Patent Fire Arms Manufacturing Company by Federal Electric Products Company, Newark, N. J.

The announcement was made by Louis W. Cole, president. In an interview with the press, Mr. Cole recalled that nine years ago when his company bought Federal he said his plans called for a program of expansion and the development of many new products for the electrical field. With the acquiring of the Colt line, Mr. Cole feels that that program is well under way. For to the many Federal products covering the field of safety switches, panelboards, and circuit breakers which have gained such widespread approval are added now the Colt group of service equipment and load centers, multi-breakers, motor starters and overload relays which have been distributed and

the problem
Test rack wiring for motion economy and Simplified Work-up
the answer
PLUGMOLD "plug-in-anywhere" MULTI-OUTLET SYSTEM WIRING
No. 2100 PLUG MOLD
FITTINGS
MIDGET TWISTLOCK RECEPTACLE No. 2127 H
POLARIZED RECEPTACLE No. 2127 P
T-SLOT RECEPTACLE No. 2127 S
PLUG RECEPTACLE No. 2127
SINGLE POLE SWITCH No. 2140
● With Plugmold, it is a simple matter to plan work-speeding wiring conveniences such as this test rack installation . . . with any desired number of outlets in any required combination . . . EXACTLY where they are needed.
Plugmold finds application wherever power must be brought to the workers' fingertips in industry. Future planning for hospitals, schools, stores, public buildings and homes will also stress this most modern approach to wiring for functional utility. Write for Plugmold data sheets and new Wiremold bulletins detailing installation.
WIREMOLD CAN HELP YOU PRODUCE FOR WAR . . . WHILE YOU PLAN FOR PEACE!
KNOW YOUR WIREMOLD AND YOU KNOW THE ANSWERS
THE WIREMOLD COMPANY HARTFORD 10, CONN.

known nationally to a host of loyal users — many since the inception of the company in 1888.

The consolidation of these two organizations under the Federal name was seen by the industry as a move to bring together the manufacturing, engineering and selling facilities of two companies with complimentary and supplementary markets. This undoubtedly will make Federal one of the largest and most prolific producers of electrical control devices in its field and leaves no doubt as to Federal's growth to leadership. It is estimated that the combined area of the two plants totals more than seven acres.

Mr. Cole stressed the fact that the manufacture of motor controls and other Colt products would be continued at Hartford with the same personnel — but under the personal supervision of Thomas M. Cole, executive vice president of Federal, whose drive and energy have been responsible for many Federal innovations and the fast growth of the company.

Government News and Views For the Electrical Industry

Limited Water Heater Production Authorized

Limited production of electric water heaters for civilian use has been approved by the War Production Board at an annual rate not to exceed 37 per cent of total production by the industry during the base period (July 1, 1940, through June 30, 1941), WPB reported in July.

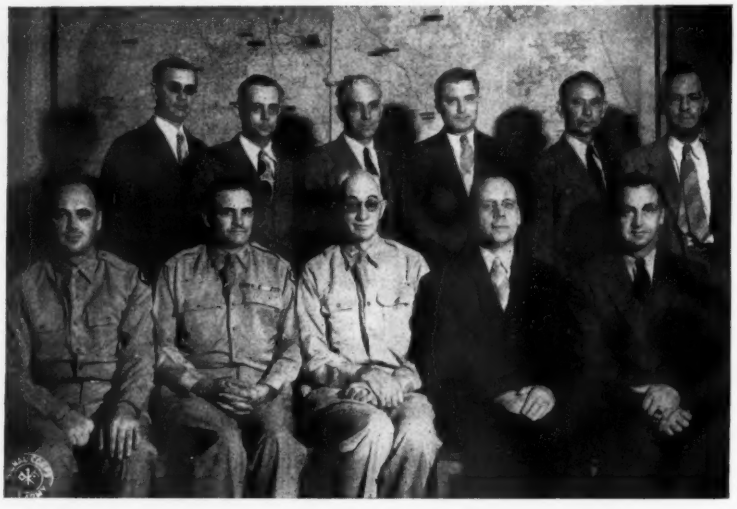
Production of electric water heaters for civilian use was heretofore prohibited, except when found necessary to allow some production for civilians on an appeals basis. Establishment of a regular quota for production will eliminate the necessity of appeals.

New quotas also have been established for production of non-electric water heaters. Restrictions on manufacture or fabrication of metal jackets for water heaters have been eliminated, WPB said.

The foregoing actions were taken to implement the water heater program that was established to meet necessary civilian requirements for such equipment, it was explained. Production of water heaters for the Army, Navy, Maritime Commission and War Shipping Administration will be in addition to established quotas, WPB said.

Metal jackets are again permitted for water heaters because paperboard jackets had proven unsatisfactory. The industry used these jackets as substitutes after restrictions were placed on the use of metal for this purpose. The manufacture of metal jackets requires less man-hours than paperboard jackets. Also the present critical shortage of paper makes it necessary that other materials be used.

Manufacturers are now permitted to make metal jackets for water heaters from allotted materials or from aluminum which is specifically authorized for jackets by WPB under the aluminum order, M-1-i. In addition manufacturers are being permitted to use materials in inventory on May 8, 1944, and those obtained from frozen, idle and excess inventories as were already allowed under previous restrictions.



WARTIME COORDINATORS MEET—Regional coordinators of the Utilities Wartime Aid Program met in Atlanta recently to review final reports of the program. Details of the closing phase of the program were discussed. Those in attendance included, seated, left to right, V. Bruce Sundstrom, Major, C. E., Chief, Utilities Section, Office, Deputy Engineer; Frank L. Seymour, Colonel, C. E., Deputy Engineer; R. F. Fowler, Brigadier General, U. S. Army, Service Command Engineer; Leroy D. Martin, Chief, Electrical Unit, Utilities Section, Office, Deputy-Engineer; Edward J. Smith, Ex. Asst., Electrical Unit, Utilities Section, Office, Deputy Engr. Standing, left to right, E. J. Muir, Chief of Contracts Division, Tenn. Valley Authority, Chattanooga, Tenn.; W. R. New, Electrical Engineer, Tenn. Valley Authority, Chattanooga, Tenn.; R. H. Reynolds, Industrial Power Engineer, Carolina Power & Light Co., Raleigh, N. C.; R. M. Grogan, Distribution Engineer, Alabama Power Co., Birmingham, Ala.; C. H. Summers, Asst. Supt. of Distribution, Florida Power & Light Co., Miami, Fla.; V. F. Pennington, Supt. Wholesale Operations, Georgia Power Company, Atlanta, Georgia.

Construction Work in L-41 Given New Interpretation

Amplification of the description of the kind of construction work covered by Paragraph (b) of Order L-41, providing a more detailed definition of "the installing of equipment and fixtures," was made by the War Production Board recently.

This action was accomplished by issuance of Interpretation 9, which specifically states that certain kinds of installation are construction and are governed by the restrictions of L-41. The following kinds are listed:

Engineering and Physics Library

"The installation of any piece of equipment or fixture which is attached to the plumbing system of a building; the installation of any piece of equipment or fixture which involves putting new wiring in a building; the installation of any piece of equipment or fixture for which a base or foundation must be built; the installation of any piece of equipment or fixture cemented to a floor or wall of a building; the installation of a furnace or stoker connected by pipes or flues or wiring to the building."

The following kinds of installations are not considered construction under L-41:

"The installation of a counter, tables or booth which is attached to the building only by nails or screws and which can be removed as a unit and will only make it necessary to fill up the holes left by the nails or screws (however, if the counter contains equipment which is attached to the plumbing system, construction is involved); the installation of a piece of equipment or fixture which requires only making a connection to an existing wiring outlet (if new wires must be run or a new outlet built into the wall or ceiling, construction is involved)."

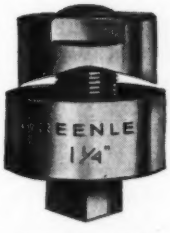
WPB said these examples illustrated the general principals concerning installations constituting construction under the restrictions of L-41. In case of doubt as to a particular installation, WPB suggested the nearest WPB regional office should be consulted or an application be filed for permission to proceed with the work.

* * *

Unlike some other war production industries, the radio industry faces increased requirements for the last half of 1944, members of the Electronics distributors Industry Advisory Committee were told by War Production Board representatives at a meeting in July, WPB reports. As a result, any marked increase in radio and electronic equipment supplies for civilians is unlikely in the future.

* * *

A new electric heater cord set may now be bought without turning in the old set, the War Production Board has announced. This change is made by amended version of Order L-277, formerly covering heater cord sets, and Order L-65, which now no longer controls heater cord sets.



KNOCK-OUT Tools

Eliminate time spent on drilling and filing to enlarge a hole. In 1½ minutes or less you can cut a hole up to 3½" with the GREENLEE Cutter or Punch. Just insert the tool in a knock-out or small drilled hole, give a few turns of the drive nut with an ordinary wrench!

These tools cut clean, round holes in bakelite, hard rubber or any metal up to ⅛" thick.

Other GREENLEE time-saving tools for electrical work:
CABLE PULLERS
JOIST BORERS
HAND BENDERS
RADIO CHASSIS PUNCHES
PIPE PUSHERS

"Over five years ago we saw the GREENLEE Pipe Bender on a job, liked its performance and bought *two* for our own use", says Mr. James A. Hays, Foreman MacKay Electric Co., Kansas City, Mo.

"Large *time and material* savings are made with the GREENLEE especially on any job where great quantities of pipe are being used"... Mr. Hays continues... "and outside of a little hydraulic oil used the maintenance costs total practically nothing!"

Leading contractors throughout the country have been selecting GREENLEES for these same reasons. They can be carried, set up and operated by one man... make smooth, accurate bends where you want them—no kinks or other damage to conduit.

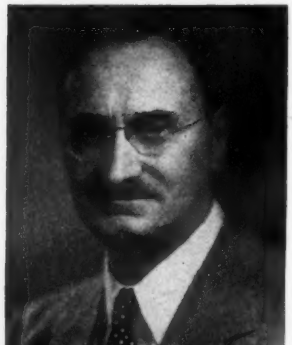
Pipe up to 4½", rigid and thin-wall conduit, tubing, bus bars...*whatever* the bending job... there's a GREENLEE to do it better, faster. Catalog 33E tells whole story on GREENLEE Benders and other special tools for electrical work. It's yours free—just write to Greenlee Tool Co., Division of Greenlee Bros. & Co., 1768 Columbia Ave., Rockford, Ill.

Get Ready with Greenlee!

REGISTERED TOOLS
GREENLEE
FOR THE CRAFTSMAN

PERSONAL NOTES
About Men You Know

Charles A. Powel, manager of Headquarters Engineering of the Westinghouse Electric and Manufacturing Company, was elected president of the American Institute of Electrical Engineers for the year beginning August, 1944.



C. A. Powel

The President's badge was presented to Mr. Powel at ceremonies opening the Institute's Summer Technical Meeting which ran for five days through June 30. A former vice president and director of the AIEE and long noted as a diagnostician of power plant problems, Mr. Powel will succeed **Dr. Nevin E. Funk**, vice president of the Philadelphia Electric Company.

Born sixty years ago in Rouen, France, the son of Welsh parents, Mr. Powel was educated in London, England, and in Switzerland. In 1905 he joined the internationally-known Swiss electrical firm of Brown Boveri & Company in Baden, Switzerland.

He remained with Brown Boveri until 1915, spending the last four years as resident engineer in Kobe, Japan. During World War I he joined the civil branch of the British Ordnance Department and in 1916 came to the United States as an inspector with the British War Mission. He remained here to take up permanent residence and eventually American citizenship.

Honorably discharged from the British Service in 1919, he joined the General Engineering Department of Westinghouse at the East Pittsburgh, Pa., plant, specializing on power system engineering problems. In 1932, Mr. Powel was named manager of the Central Station Engineering Department at East Pittsburgh and six years later was named manager of the then newly-formed Industry Engineering Department. He was named to his present position in 1941.

* * *

Electromaster, Inc., peacetime producers of electric ranges, and water heaters, announces the appointment of **H. K. "Pete" Dewees**, of Atlanta, Georgia, as sales agent for the southeast. His territory will include Georgia, Alabama, North and South Carolina, Florida and Tennessee.

"Pete" Dewees is well known among members of the electrical industry in the South. When he graduated from college, he went to work for the Union Electric Company, of Pittsburgh, Pa. Later he joined the staff of Edison General Electric Appliance Company with whom he remained for 20 years. He was located at different times in Pittsburgh, Chicago, Minneapolis, Dallas, and Atlanta, being the district manager in four of these cities. Since much of Dewees' business life has been spent in the South, he has acquired a large number of friends there in all branches of the industry — utilities, distributors, and dealers. He brings to Electromaster a wealth of experience and a thorough knowledge of the territory he is to service.

One of Dewees' first acts as an Electromaster representative was to appoint Air Engineers, Inc., of Birmingham, as distributors of Electromaster domestic appliances for Alabama and western Florida. This company has been in the electrical appliance business in this area for many years in addition to operating a contract and

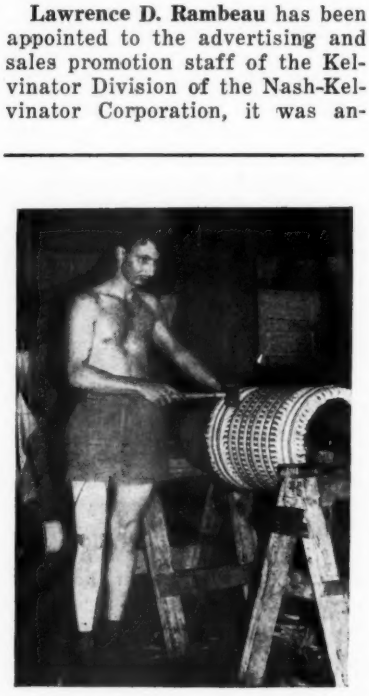
H. K. (Pete) Dewees

industrial division for refrigeration, air conditioning, and automatc heating apparatus.

These appointments are further steps in Electromaster's twofold postwar program, one phase of which is the development of a broad new marketing program. An adequate sales and service organization is being built up to make Electromaster appliances available to customers throughout the country.

* * *

Lawrence D. Rambeau has been appointed to the advertising and sales promotion staff of the Kelvinator Division of the Nash-Kelvinator Corporation, it was an-



Disabled service men, returning from the battlefronts can take encouragement from Johnny Carrol, key armature winder of the Payne Electric Works, Houston, Texas. An artificial limb has not prevented him from "getting the job done." Carroll is shown here in his summer work clothes—brief but cool.

nounced recently by **C. J. Coward,** Kelvinator's director of advertising. Rambeau will be in charge of Kelvinator's program of sales training for the postwar period.

In war work with the Glenn L. Martin Company for the past two years, Rambeau was formerly manager of the Philadelphia office of the Jam Handy organization. With this organization for five years, he was in charge of sales training and field work covering the Eastern Atlantic Coast regions, and was responsible for national accounts whose sales training programs had been among the most outstanding in America.

* * *

David M. Kelly has been appointed to the engineering staff of the John C. Dolph Company, Newark, N. J., in charge of the Industrial Service Division. He was formerly associated with the I.T.E. Circuit Breaker Company of Philadelphia, Pa.

* * *

The Anaconda Wire and Cable Company has announced two new territorial changes. **Dan Mabel** has been appointed district manager of the New Orleans office, and **H. V. Van Valkenburg,** who for the past number of years has been located in their Washington office engaged in government contact work, has been appointed district engineer with headquarters at Chicago, Illinois.

* * *

Allan C. Davey has been appointed sales manager of the Clark Water Heater Division of the McGraw Electric Co., according to announcement by **A. E.**

Allan C. Davey

May 15 NEWSWEEK · May 29 TIME · June 10 BUSINESS WEEK · July FORTUNE
Don't blow your top, too!
Keep a cool head. Rise above the sizzling summer heat just ahead. Snap the switch on your electric fan.
Where is it, now? Gathering dust? Are its moving parts thirsty for oil?
Better check it. And if it needs repairing, call your dealer, today.
No need to tell you that spare parts are scarce. No need to tell you, either, that when summer is here to stay, the heat will also be on your dealer.
He'll be up against a flood of fan work when he, like everyone else, is short of service help. The time is now.
The time is also now for any problem you have involving electric motor application, materials handling, converting machines to direct drive, ventilating, or pumping. Write us! We'll be glad to help. Address: Robbins & Myers, Inc., Springfield, Ohio. In Canada: Robbins & Myers Co. of Canada, Ltd., Brantford, Ontario.
ROBBINS & MYERS, Inc.
MOTORS HOISTS CRANES MACHINE DRIVES FANS MOYNO PUMPS

So the World won't beat a path to your door . . . *all at once!*

Why do so many folks wait until a heat wave arrives before they make a move to get their electric fans in shape? Bet you'd like the answer to that one, too!

Not knowing the answer, but determined to do what we can to keep you from being swamped with repair work, Robbins & Myers national advertising asks people to give you and themselves a break this summer.

Planning just a bit ahead will help a lot. We're planning to provide you with the best fans ever, just as soon as we finish our wartime job of building stabilizers and automatic pilots for the Norden Bombsight System. Robbins & Myers, Inc., Fan Sales Division, Springfield, Ohio.

FOR REPAIR PARTS OR REPAIR JOBS DONE FOR YOU, GET IN TOUCH WITH US OR THE NEAREST R & M BRANCH.

NEW YORK, 200 Varick St. CHICAGO, 2400 W. Madison St. PHILADELPHIA, 401 N. Broad St.
KANSAS CITY, B. M. A. Bldg., Room 325, 215 Pershing Rd. SAN FRANCISCO, 237 Rialto Building
NEW ORLEANS, 116 Arlington Dr. DALLAS, 1100 Cadiz St.
THE ROBBINS & MYERS CO. OF CANADA, LTD., Brantford, Ont.

A Name You'll Want to Remember When the War Is Won-

CLARK

ELECTRIC WATER HEATERS

A Toastmaster Product

Let's Do All We Can to Help Win the War Now-

BUY MORE BONDS!

★

McGRAW ELECTRIC COMPANY

CLARK WATER HEATER DIVISION

5201 W. 65th St. Chicago 38

Julian, general manager of the division. Mr. Davey was formerly sales manager of the Wisconsin Public Service Corporation and for many years has been prominently identified with the electric industry in the state of Wisconsin. He will make his headquarters at the Clark Water Heater factory in Chicago, Illinois.

NEW EQUIPMENT and MATERIALS

Automatic Lamp Starter

Lloyd Products Company of Providence, R. I., has announced a new starter for fluorescent lamps, the Lloyd "Automatic," a new automatic lockout-reset type. When a lamp becomes defective, and flickers or blinks, this automatic starter cuts off all current from the entire unit—ballast and lamp. Because all current is cut off, overheating of the ballast is prevented, thus tending to increase its active life.

When the defective lamp is replaced with a perfect one, this new Lloyd starter resets itself automatically and lights the lamp. It is not necessary to touch the starter. The action is entirely automatic.

Another distinctive feature of the Lloyd "Automatic" Starter is the plastic can. It is molded from a red, thermo-setting bakelite with high dielectric properties, providing exceptional strength with less weight. The can is sealed and has no projecting lugs to cause trouble. The knurled rim insures positive grip for inserting or removing starter.

The maker states that the results of continuous tests indicate that the life of the "Automatic" starter is several times greater than that of the average lamp.

New Dry-Type Transformer

The Allis-Chalmers Manufacturing Co. has introduced a newly designed dry-type transformer which embodies a unique induced cooling system. This built-in system operates automatically to provide extra cooling when transformers are overloaded.

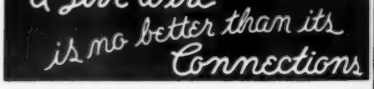
As described in the company's new bulletin B6334, the new equipment includes a Z-section baffle which extends from one end of the transformer to the other, channelizing air flow. When temperatures reach the overload level, exhaust fans cut in, forcing cool air vertically through the core structure and horizontally between the coils.

Placed on the top and back of the transformer, the fans are protected by screening set flush with the metal casing which incloses all operating mechanisms.

A Live Wire is no better than its Connections

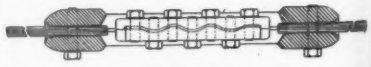
STRAIGHT CONNECTOR

for Aluminum Cable



BOLT-PRESSURE TYPE

Capacity: No. 4 to 4/0—With Solid Core Wire Only



FULL CONDUCTIVITY AFTER JOINING CABLE . . . GRIP EQUAL TO TENSILE STRENGTH OF CABLE

Designed to join cable, comprised of one hard steel wire surrounded by aluminum strands. A joint thus made will withstand a tensile strain equal to the rated tensile strength of the cable itself, without injury to the cable, and without (by test) causing a noticeable millivolt drop.

WRITE FOR BULLETIN 14-A

K&H KRUEGER & HUDEPOHL

Solderless Terminal Lugs and Connectors

VINE AT THIRD-43 • CINCINNATI, OHIO

Safety Door Interlock Switch

A new door interlock switch, designed as an emergency device to interrupt control circuits where access doors are opened when the power is on, has been announced by the Specialty Division of the General Electronics Department, at Schenectady, New York.

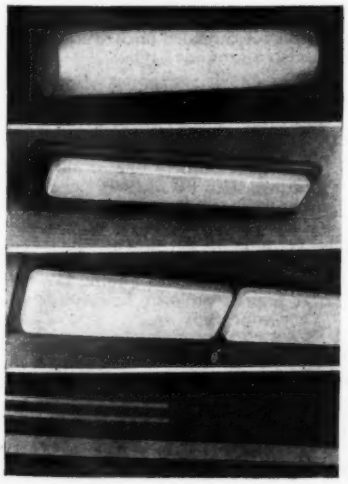
It has a carrying capacity of 10 amp, 110 or 220 volts, a-c or d-c, and an emergency opening capacity of a-c 7½ amp, 110 or 220 volts; d-c on low inductive circuits, 5 amp, 125 volts; 2½ amp, 250 volts.

Application covers a wide range where doors, windows or covers must be interlocked for the protection of the equipment and safety of the personnel. For example, doors on radio transmitters, X-ray and therapeutic machines, burglar alams, and signal controls for fire doors.

Plexiglas Lamp Shades

The adaptation of scientific controlled lighting to the over-all functional design that will be a prominent feature in peacetime architecture has been satisfactorily accomplished, according to the Safety Car Heating & Lighting Co., Inc., by fluorescent lighting fixtures with white, translucent Plexiglas shades.

This widely used plastic material can be fabricated to satisfy any architectural design requirements; its strength is a safety advantage in public buildings, boats and buses. The four illustrations shown here demonstrate some postwar applications of Plexiglas in the lighting field. From top to bottom the illustrations are: (1) Fluorescent capsule light with translucent Plexiglas shade. (2) Fluorescent wall light with Plexiglas shade. (3) Tandem fluorescent ceiling light with Plexiglas shade. (4) Continuous fluorescent sidewall light with combined Plexiglas and sheet metal shade.



HELPING ELECTRICITY SERVE AMERICA BETTER!

BETTER WIRE JOINTS

with IDEAL "WIRE-NUTS"
(Solderless, Tapeless Wire Connectors)

In the electrical wiring of factories, homes, public buildings, etc., leading electrical contractors are using millions of IDEAL "Wire-Nuts" because they make wire joints that are neater, safer, quicker, better electrically—stronger mechanically. IMMEDIATELY AVAILABLE . . . because no critical material used. Approved by Underwriters' Laboratories, Inc.

Other IDEAL WIRING DEVICES

Today and Tomorrow thousands of new wiring jobs in Industrial Plants and in construction will be facilitated with IDEAL Wiring Devices:—

E-Z Wire Strippers
Lugs, Solder and Solderless
Fish Tape Reels and Pullers
Joist Boring Machine

SOLD THROUGH JOBBERS
PROMPT DELIVERY

IDEAL Sycamore

IDEAL COMMUTATOR DRESSER CO.
1017 Park Ave. Sycamore, Ill
Sales Offices in all Principal Cities

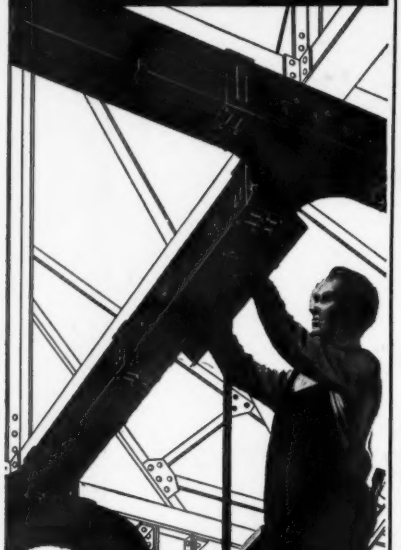
FOR FOUR 40-WATT FLUORESCENT LAMPS

Whenever an installation requires the combination of Beauty plus Sturdy Construction Curtis Star Lux is the first choice! This 4 lamp pendant-type fluorescent unit is designed and built for long continuous service and its inherent beauty is maintained with a minimum of attention. Be prepared to meet your next job of this type . . . get full details of Curtis Star Lux.

Our data sheet No. 1400 awaits your request.

CURTIS Lighting, INC.
6135 WEST 65TH STREET, CHICAGO 38, ILLINOIS

"GET-AT-ABLE" WIRES
FOR *URGENT*
INSTALLATIONS



May be mounted direct to wall
(No projecting brackets necessary)

NATIONAL
FOUR BY FOUR
WIREWA

Quick and easy to install couplings.
Only two bolts to tighten.

National Electric 4 x 4 is designed for real production plants where speed in electrical maintenance and installation is a factor. Manufactured in standard sized sections with spring latched covers, quick access to any section is assured.

Its four inch square dimension provides ample room for a large number of cables. Knockout clusters for various size conduit extensions are provided every 4¾ inches in the back and sides.

Write for a new 4 x 4 Wirewa catalog which will give you complete listing of all fittings as well as installation data.

NATIONAL 4 x 4 WIREWA IS MANUFACTURED BY THE SAME MAKERS OF "GORILLA GRIP" MECHANICAL CONNECTORS

National Electric
PRODUCTS CORPORATION
Pittsburgh, Pa.

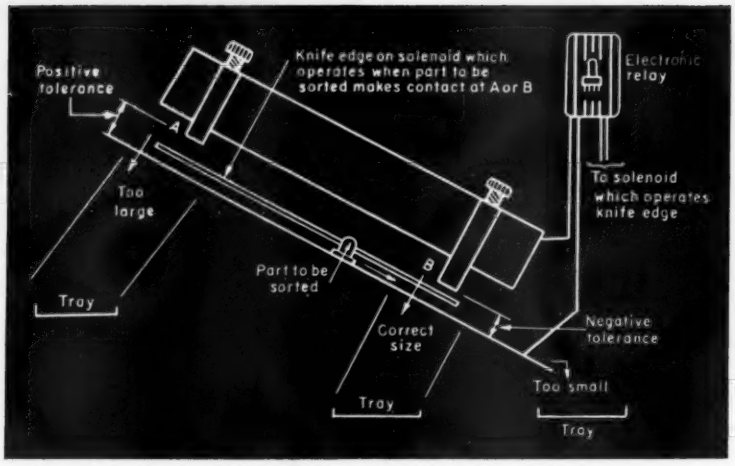


Fig. 7. This detailed drawing of the sorting device shown in Fig. 6 shows how relay is connected to sort assemblies by size.

New Kitchen Booklets

Two new colorful booklets with related titles, have been released by Mullins Manufacturing Corporation, of Warren, Ohio, makers of Youngstown steel kitchen cabinets and cabinet sinks.

One, "Get Acquainted with your Kitchen," is a war-time consumer catalog containing many full-color pictures which tell the story of kitchen modernization and illustrate it with many "before and after" pictures. The book also contains some stunning examples of what can be accomplished when a Youngstown kitchen dealer is given full sway.

Electronics Applied to Industrial Problems

(*Continue dfrom page 30*)

A conveyor belt with one of the rolls insulated from the others and ground is shown in Fig. 5. The actuating contacts of the electronic relay are connected between the insulated roll and the adjacent roll. The output circuit may be connected to a counter or any other type of mechanism which is to be operated. If the material traveling over the conveyor belt creates a resistance (500,000 ohms or less) between these two rolls, the electronic relay can be used to count the number of items traversing the two rolls. By various arrangements of insulated rolls, the electronic relay can also function as a pressureless limit switch .

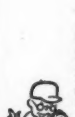
The electronic relay and a contact head are incorporated in a specially designed table used to sort small parts. This electronic sorting table diverts these assemblies into different channels, depending on their size, that is, whether they are too high, too low, or within the tolerances. See Figs. 6 and 7.

Each assembly is fed onto a slide which is part of the contact head. About halfway down the

CONDUIT TYPE
END FITTINGS
...by O.Z.

This Type "E" End Fitting is designed especially for ends of conduit. The body is of malleable iron, cadmium plated; the cover is of molded canvas Bakelite having high dielectric and mechanical strength. Standard holes in the cover provide for spacing and insulating the wires individually as they open up from the conduit end. Covers can be drilled for any number of holes. Types for threaded or threadless conduit, also a grounded type.

ONE STANDARD . . .
ONE SOURCE OF SUPPLY



The new O. Z. Catalog No. 125 lists the complete line of electrical fittings with detailed specifications, photo diagrams and prices. It includes Conduit Fittings . . . Cable Terminators . . . Junction Boxes . . . Solderless Connectors . . . Power Connectors . . . Grounding Devices. A request on your letterhead will get your copy.

O.Z ELECTRICAL MFG. CO.
262 BOND STREET · BROOKLYN, 2 N. Y.

Represented by

M. L. WHITMAN 313 Bona Allen Bldg., Atlanta 3, Ga.
W. J. KELLER 304 Natchez Bldg., New Orleans 12, La.
F. B. OSTERMUELLER 6935 Meadow Lake Ave., Dallas 14, Texas

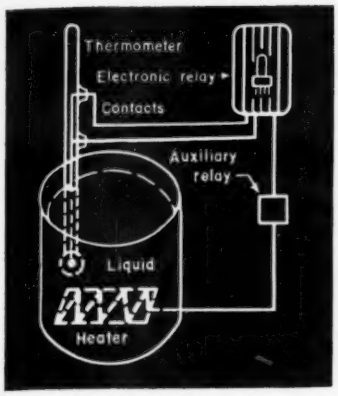
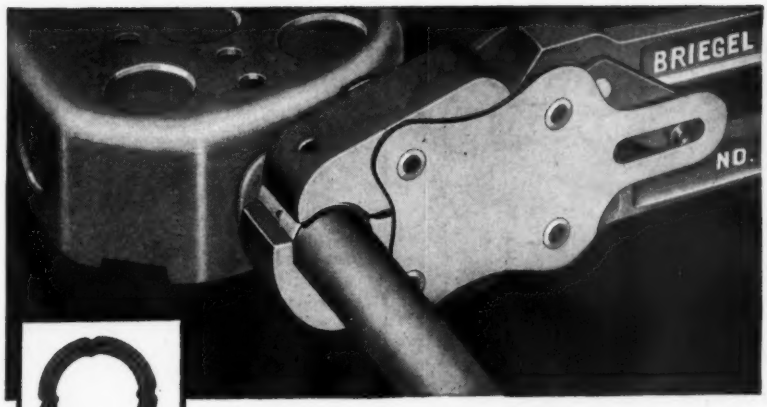


Fig. 8. Electronic relay connected to maintain constant temperature in a process.

slide, the assembly comes to a contact point located at a preset height. If the assembly touches the point, it is oversize, and the contact thus made closes the input circuit of the electronic tube of the relay. This energizes an electromagnetic relay, then a solenoid is energized which sends the assembly down a chute into a container for oversize parts.

The second contact point is set at a point the height of which is the standard height less the tolerance. As oversize assemblies have already been eliminated at the first contact point, parts touching the second point are within acceptable limits and are "shot" down another chute. Undersize assemblies do not touch either point and slide undisturbed to a third tray.

The electronic relay can be used to maintain a nearly constant temperature in a process, as shown in Fig. 8. A thermometer, the mercury of which is connected to the electronic relay by means of a probe or contact-sealed in the thermometer, is inserted in the liquid which is to be maintained at a constant temperature. The contact which determines the temperature at which the relay operates can be a permanently fixed contact, or a contact, inserted in the top of the thermometer, the position of which can be readily changed. Thus, as the mercury makes connection between the two contacts, the electronic relay operates an auxiliary relay which disconnects the power to the heater in the temperature bath. The time-delay feature permits this system to operate smoothly without rapid fluctuations.



Cross section Showing Indentations.

E·M·T·UP THE QUICK WAY

Two Squeezes and it's Set

TWO QUICK SQUEEZES give you Finer, Faster Conduit Connections. B-M Fittings do away with the twisting, turning and tightening of nuts and save you valuable time and materials. Then too, they are stronger, neater and much easier to work with in tight places. Start using B-M Fittings today. Have more satisfied customers—more profits from each job!

(All B-M Fittings carry the Underwriters Seal of Approval)

DISTRIBUTED BY

The M. B. Austin Co., Chicago, Ill.
Clayton Mark & Co., Evanston, Ill.
Clifton Conduit Co., Jersey Cy., N. J.
Gen. Electric Co., Bridgeport, Conn.
The Steelduct Co., Youngstown, Ohio
Enameled Metals, Pittsburgh, Penn.
National Enameling & Mfg. Co., Pittsburgh, Pa.
Triangle Conduit & Cable Co., New Brunswick, N. J.

Prompt Deliveries on Properly Rated Orders

BRIEGEL METHOD TOOL CO. • Galva, Ill.

Pedigree

Electrical INSULATING VARNISH

Can Give You

GREATER PENETRATION • RESISTANCE TO OILS, ACIDS, ALKALI • FLEXIBILITY ABRASION RESISTANCE • FASTER PRODUCTION

You can get all of these advantages at a minimum of overall cost when you complete your electrical jobs with Pedigree electrical insulating varnish.

Why not give us an opportunity to show you how you can take advantage of these benefits — either in your present production or your postwar plans.

The PRODUCT with a PEDIGREE

***The* P. D. GEORGE CO.**

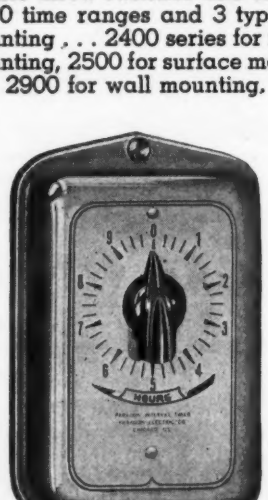
5200 North Second Street • St. Louis, Missouri

Call In the Pedigree Varnish Man Nearest You.

assured with **Paragon**

PRESET TIMERS

Paragon improved manually preset timers can be preset to perform a great variety of operations . . . to allow a given operation to continue for almost any pre-determined time limit . . . to close or open a circuit at the end of the preset time. Synchronous motor operated. Assures absolute accuracy of the timing cycle. Not affected by vibration or changes in ambient temperature. Supplied as standard with single pole, double throw switches and choice of 10 time ranges and 3 types of mounting . . . 2400 series for flush mounting, 2500 for surface mounting, 2900 for wall mounting.



2509 for surface mounting.

PARAGON ELECTRIC CO.
713 OLD COLONY BUILDING
CHICAGO 5, ILLINOIS

Mr. Tops, the Paragon symbol of top quality.

Alternate for Varnished Silk

A seamless bias alternate for varnished silk obtainable in continuous length rolls of 36 or 72 yards, is announced by the manufacturer, the Irvington Varnish and Insulator Co., Irvington 11, N. J.

The new material, the makers state, has been introduced to eliminate the need for splicing 51" bias cut strips. It is emphasized that whereas the sewed or cemented seams of spliced fabric often prove bulky or mechanically weak, the new alternate's freedom from seams or splices permits uniformly tight, taping.

Appliance Purchases Charted by Survey

(*Continued from page 12*)

washing machines was the first choice, only 29 per cent had an old one that was unsatisfactory, while 69 per cent have none now but want one. Moreover, within this 69 per cent more than one-third gave "Difficulty with services" as the reason for needing a washing machine. In contrast, 49 per cent of those who named radio as their first choice wanted to replace an old one, 46 per cent have none but want one, and 5 per cent say that perhaps they don't really need one after all. This indicates that nearly one-half of the existing radio market as estimated above comes from families which now have no radio, and half of these report that they can afford one for the first time.

Interviewing was carried out by the Special Surveys Division of the Bureau of the Census in 68 counties or pairs of counties selected as representative of the whole population of the United States. This sample, designed originally for the Monthly Report of the Labor Force, has been checked and cross-checked in a considerable number of different ways and is considered highly reliable, according to OCR.

So far as the representative character of the respondents and the number of interviews are concerned, the survey results may be regarded as accurate within a very small margin of error. The responses, however, indicate only the intentions and attitudes of the respondents at the time they were interviewed and therefore do not reflect the size of the potential market under conditions which will prevail when the various items covered are actually back in quantity production, OCR pointed out.

Veteran Texas Dealer Looks at Postwar Days

(*Continued from page 14*)

of solicitors . . . in fact, it is our plan to train an entirely new set of sales people, sales people that will not carry over any of the old practices of house-to-house selling.

"At one time, we employed 28 outside salesmen, not more than ten of them being dependable. The other 13 kept us in hot water and they were frequently balled up in their deals, or they would make all kinds of promises, collect a commission, and then leave us with a dissatisfied customer to straighten out. We believe the entire appliance field will be on a much higher plane when we all resume business again — at least for a few years.

"We have always handled our own finance paper. We have always been opposed to 36 months to pay $200, or even 24 payments. We hope that installment selling in the postwar era will be held within 18 months — but there will be little necessity for much installment selling for some time.

This electrical merchant learned

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one particular lesson in appliance merchandising the hard way, although he eventually profited from the experience and expects to profit by it during the postwar period. His analysis reduces down to this: "It is easier to sell the husband a labor-saving device for the home than it is the wife." This formula for closing major appliance sales comes from experience in selling Bendix washers.

Mr. Lansdowne jumped the gun a bit on these new units, did a lot of advertising, attracted a lot of women to the store, and even brought in 2360 women from church and other clubs by paying them 10c to 25c to come in small groups of 20 to 30 and watch demonstrations. It seemed that every woman was a sure-fire prospect . . . yet not a single sale was made. Lansdowne was personally putting on the demonstrations. He was stopped cold; he selected 10 of the most likely prospects and called on them. He found them sold but friend husband had said, "What! Another darn gadget — you know those machines won't do what they claim!"

The next step was to show the husbands; then washers began to sell. When one washer was sold in a block, neighbor began to buy. From that experience this merchant now knows that when it comes to selling a major electrical appliance, and especially a new type of washer or a quick freeze unit, the husband must see the unit and he is the first one willing to part with the money to help the little woman have things easier and more convenient in the home.

Temperature Control Service Problems

(*Continued from page 16*)

or assembly of the parts.

A slight jarring of the control, a slight movement of the knob, or even the closing of the cabinet door, may release the bellows arm. At the end of 1940, a projection was added to the side of the bellows arm to eliminate this trouble.

If a correction cannot be made by replacing a warped cover or missing locking clip, the control can be replaced or "hot water defrosting" (where the knob is turned to "off") can be recommended.

A warped cover is usually caused by excessive humidity and

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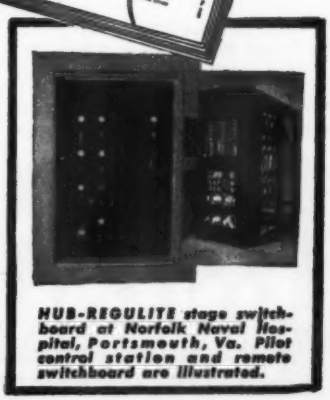

HUB-REGULITE stage switchboard at Norfolk Naval Hospital, Portsmouth, Va. Pilot control station and remote switchboard are illustrated.

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Probably the exact Power Connector you want is shown in the Penn-Union Catalog.

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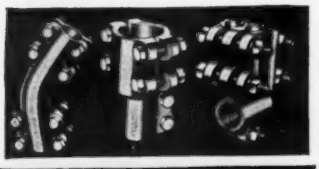
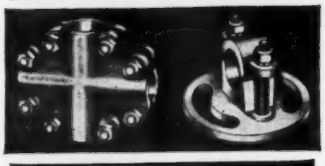
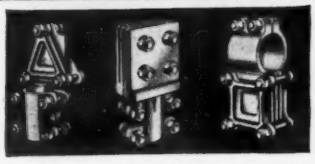
—each in a wide range of sizes, up to the largest. Here are a few of the many types:







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PENN-UNION
Conductor Fittings

is infrequent except in tropical climates or in hot coastal areas. Early covers which are held on by a screw sometimes warp. The ends of the cover bend outward so there is a gap between them and the control case. Sometimes the warping is sufficient to allow the outer bearing of the brass bellcrank to slip off its post. A warped cover must be replaced.

If the internal parts of the control are corroded badly, the control should be replaced with a later one having a recessed cover held on with wire clips. Except for an unpainted bellows, corrosion should not affect the operation of the control parts since the moving parts are made of stainless steel.

There are other service difficulties that may result in the cabinet being too cold and the machine running all the time. These are (1) movable contact arm binds, (2) bridle caught on stop, (3) too long terminal screw, (4) shorted control leads.

If the movable contact arm binds so the contacts are kept closed, the machine will run all the time and the cabinet air temperature will be too cold. In a previous paragraph the condition was discussed where the movable contact arm binds and holds the contacts open. The same general considerations apply when the movable contact arm binds so as to keep the contacts closed.

If the bridle arm is caught on the stop toward the terminal side of the control, the contacts will be kept closed, the machine will run all the time, and the cabinet air temperature will be too cold. In a previous paragraph, the condition was discussed where the bridle caught on the stop in such a manner as to hold the contacts open. The same general considerations apply in this case.

The control terminal screws are supposed to be 7/32 or 1/4 inch long. If a longer screw, such as the 1/2 inch screw used on type R relays with clip terminals, is used in the stationary contact terminal, the contact may be forced inward far enough to close the gap and keep the machine running continuously. The remedy is to replace the screw with one of the proper size.

If the insulation is stripped off one of the control leads near the terminal; the bare wire may short to the other lead or its terminal and cause the machine to run continuously. The remedy is to find the short circuit and insulate the control lead or leads involved.

In the case of two-knob controls, a complaint of cabinet being too cold is sometimes found to be the result of a creeping temperature knob. If the temperature knob of a two-knob control creeps toward a colder setting from the position in which it is set, the remedy is to install a crimped spring washer under the knob to prevent it from creeping.

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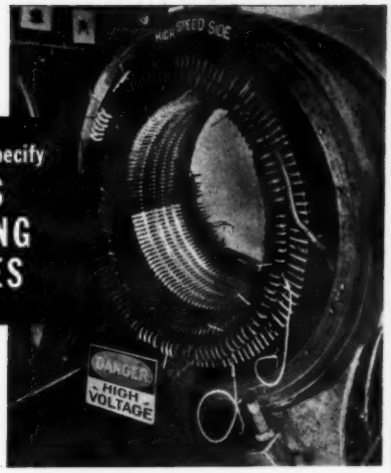

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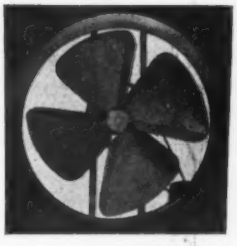

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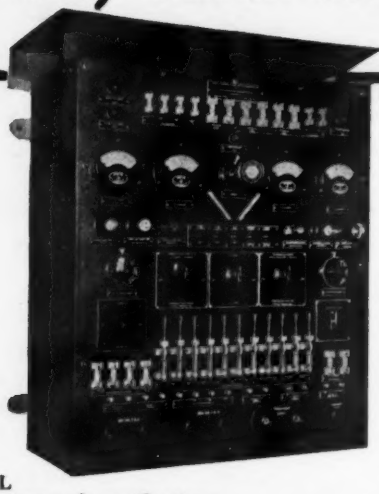

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